

1917.
NEW ZEALAND.

DEPARTMENT OF AGRICULTURE, INDUSTRIES, AND
COMMERCE.

ANNUAL REPORT FOR 1916-17.

Presented to both Houses of Parliament by Command of His Excellency.

Department of Agriculture, Industries, and Commerce,
Wellington, 6th August, 1917.

MY LORD,—

I have the honour to forward herewith, for your Excellency's information, the report of the Department of Agriculture, Industries, and Commerce of the Dominion for the financial year ended the 31st March last.

I have, &c.,
W. D. S. MACDONALD,
Minister of Agriculture.

His Excellency the Earl of Liverpool, Governor-General of New Zealand

REPORT OF THE MINISTER OF AGRICULTURE.

DURING the period under review the agricultural industry of New Zealand has come under the many-sided influences of the Great War in steadily increasing degree. The phase of semi-detachment enjoyed by this favoured land from the profound economic and industrial changes brought about in the Motherland and other countries situated round the main storm-centre appears, indeed, to be rapidly passing away. In the earlier stages of the war increased prices for our staple products were the leading factor affecting agriculture in the Dominion. While this feature still obtains, and has been strengthened and steadied by a great extension of the system of Government purchase by requisition, other factors have entered the position. The depletion of rural man-power necessitated by the requirements of the Expeditionary Forces has begun to tell heavily. In relation to the local consumer, maximum prices have had to be fixed for several foodstuffs, and other kindred measures taken to reduce the cost of living. Our overseas trade has been seriously hampered by a prolonged shortage of shipping, causing enormous accumulations of produce in the Dominion, with an attendant locking-up of funds; and, as a corollary, questions are now arising regarding the most suitable lines of farm production to follow next season. The problems thus created require to be met by increasing organization and action, in which the State must necessarily take a leading part.

It is gratifying to be able to record that, notwithstanding the handicaps already weighing on rural industry, production has again attained a high level, a position which bespeaks both enterprise and extra effort on the part of the agricultural community, and redounds to the credit of our working-farmers. While the agricultural year, taking the average of the

Dominion, has not been unsatisfactory, natural conditions militated in several directions against a full measure of success. The great cropping region of Canterbury experienced the third dry season in succession, and droughty conditions also visited the fertile Wellington - West Coast and Taranaki districts to an unusual degree during the summer months. On the other hand, in the northern districts the rainfall was excessive for best all-round results. Other important producing districts of the Dominion, however, such as Southland and Hawke's Bay, were favoured with splendid seasons, thus helping to maintain the average. The general results of the year once more demonstrate the wonderful capabilities of New Zealand in primary production, and the splendid resources possessed by the country for development and improvement.

New Zealand is in such eminent degree a food producing and exporting country that it might be thought to be quite free of food problems in relation to its own population. The war, however, has shown up a weak spot in our agricultural economy in connection with the crop which western civilization commonly regards as the most essential foodstuff—namely, wheat. For a number of years past there has been an irregular but none the less definite decline in wheat-growing in the Dominion. The causes are well known and need not be discussed here. The main factor—the more payable nature of other crops or lines of farming—has been added to since the commencement of the war by that of the growing scarcity or uncertainty of the supply of agricultural labour. In the 1916–17 season the area devoted to wheat showed a heavy fall as compared with the increased acreage of the previous year. The result of this, combined with a comparatively low average yield owing to unfavourable weather conditions, has been an actual shortage of wheat for the Dominion's consumption. Had we been living in a time of peace and tranquility this state of affairs need not have caused much concern, on the assumption that either Australia or the American Continent would always be able to supply our comparatively small requirements even if our own wheat-growing declined to vanishing-point. But in the midst of a world war, with unknown economic developments ahead, dependence on overseas supplies of the "staff of life" could not be accepted. In view of the gravity of the issue I made a special appeal to our agriculturists to rise patriotically to the occasion and sow sufficient areas in wheat this year to at least supply the Dominion's requirements on a normal average yield; I also carried out a campaign of addresses to farmers in the principal wheat-growing districts. At the same time an assurance was given that a minimum price of 5s. 10d. per bushel would be guaranteed by the Government for the 1917–18 crop. It is a matter for great satisfaction that the practical response of the farmers promises a very substantially increased acreage, and with fair natural conditions an ample production should result. Our aim as regards wheat should be to do something more than provide from hand to mouth. A good reserve is highly desirable, even should it involve the provision of special storage. It may be recorded that the shortage of wheat in the Dominion has necessitated, since the close of the official year, a purchase by the Government of wheat in Australia.

The foregoing observations apply more or less generally to other cereals coming within the agricultural operations of the country—namely, oats, barley, and maize. Especially important is it that our production of oats be maintained at an adequate level. The acreage of this crop also shrunk seriously last season. A comparatively poor yield served to demonstrate that the margin had been cut too fine, and Australia had to be drawn upon by private trade for supplementary supplies. Considered in conjunction with the improving animal husbandry of the country, a reasonable surplus of oats should not be viewed with anxiety by our farmers, even though export facilities may be curtailed. Far greater quantities in one form or another could be profitably fed to stock. New Zealand has also been an importer of maize during the year.

While the Dominion has maintained during the year the high general standard of health of its live-stock, there are still directions in which special vigilance and efforts are required for the prevention and repression of disease. Tuberculosis, contagious abortion in dairy cows, and blackleg may be mentioned in this category. As regards blackleg, the incidence of which now especially concerns parts of the Auckland District, active measures are in hand to bring the disease under the same successful control as in Taranaki. It is very satisfactory to note that stud-stock breeding is proceeding in expanding degree, and importations of high-class purebred animals continue to be made despite war conditions. An increasing overseas demand for our stud stock, especially sheep, has also been evidenced, but shipping difficulties have limited export business. An excellent feature in connection with breeding is the strong move for co-ordination and co-operation among the various breeders' associations in the Dominion. As regards the numerical strengths of the flocks and herds, while the 1916 returns disclosed some

decrease in the aggregate number of sheep, breeding-ewes were shown to have substantially increased, approximately to the high-water mark of 1914. In respect of cattle the live-stock census taken in 1916 revealed a material increase over the figures for 1911—the latest previous enumeration. This item caused special satisfaction, some anxiety having been felt as to whether the immense increase in our beef-exports during the last two or three years had not unduly depleted the cattle stocks. The gain in cattle is shown to be of an all-round nature, and not confined to dairy cows. On the other hand, horses and swine have shown decreases. Good reasons may perhaps be found for a reduction of horses, but the decrease in swine cannot be viewed with equanimity, and every effort should be made to increase the pig stocks in support of the food-supply and an industry for which the Dominion is eminently adapted.

The industries connected with our leading primary products—meat and dairy-produce—evidenced great activity during the year. Several additional meat-works were completed and commenced operations, and others are in course of construction. As regards stock slaughtered for export, another substantial increase was recorded for cattle, but sheep and lambs (especially the latter) showed heavy decreases compared with the exceptionally high numbers of the previous year. Should this prove to have been due to a greater carry-over of ewe lambs suitable for breeding, the fact will be of advantage in view of the understocked condition of many districts.

In the dairy industry the movement from the manufacture of butter to that of cheese has continued, with a corresponding effect on the outputs of the respective branches. The net result of the year's operations was a well-maintained volume of production for the industry as a whole. The manufacture of dried milk was further developed during the year. Casein, as an adjunct to the buttermaking side of the industry, has shown renewed vitality, the product being in great demand for export at tempting rates, and all facilities afforded for dairy factories to undertake the supply. The manufacturing side of the dairy industry may be fairly said to maintain a high general standard of excellence, but the raw material—milk or cream—in too many instances still constitutes a weak spot. A wide extension of instruction to dairy-farmers in the care of milk, utensils, milking-machines, &c., is a matter of the greatest importance, and a campaign for this purpose should be undertaken as soon as conditions permit. It is believed that the large majority of dairy-farmers would welcome such action, having come to realize that it is necessary to protect their industry from the dangers threatened. Another question which seems ripe for action, and which involves no expense, is the raising of the standard for first-grade butter. There has been no change in the minimum points (88) for this grade since the grading system was instituted over twenty years ago, and it is considered that the fixing of such minimum at, say, 90 points would have a stimulating effect on quality, and bring into line a very considerable proportion of the butter-output which just scrapes into first grade or slightly over. The proposal, it is hoped, will be given effect to shortly.

Further marked progress has characterized the fruitgrowing industry, both in the planting of commercial orchards and in organization of the interests centring in the newly formed Fruitgrowers' Federation. With the exception of certain districts, light crops were the rule in the past season, but as shipping difficulties precluded exportation this was not an altogether adverse factor for the growers. A feature of the year was the enactment and bringing into operation of the Orchard-tax Act, under which funds are provided for the Fruitgrowers' Federation. A registration of all orchards throughout the Dominion was also carried out, giving a basis for thorough control of diseases, &c. Another measure calculated to operate greatly to the advantage of the fruit industry was the registration of nurseries, involving a careful inspection of young trees. The organization of the Horticulture Division of the Department has been strengthened, and the horticultural stations are being improved on lines enabling them to give the most effective assistance to the fruitgrowing industry. It is hoped that in the near future further developments may be also made by the Department in the sphere of scientific horticultural research.

Although poultry keeping or farming is commonly ranked as one of the minor rural industries, it is really in the aggregate one of great extent and of no small importance in relation to the food-supply of the country. New Zealand is eminently adapted for the industry, and we are in a position to produce all the foods required for its operation. As cereals rank first for this purpose the wheat-growing rally which promises to take place this year has also a bearing on poultry-farming. The suitability of oats and lucerne-meal for feeding for egg-production have been strikingly demonstrated during the year in valuable tests conducted by

the Department. It is hoped to shortly extend State assistance to the industry in several directions, such as by the appointment of a resident Poultry Instructor for Auckland, and the establishment of a poultry-station near Christchurch. Assistance may also be rendered by the State in connection with cold storage for eggs, official supervision of the recognized egg-laying competitions, and the training and establishment of returned soldiers in poultry-keeping. The question of the prohibition of the entry of Asiatic egg-pulp into the Dominion is now receiving the favourable consideration of the Government. Commendable activity in the interests of the industry is being shown by the New Zealand Poultry-keepers' Association, which body, it is pleasing to note, is now well in touch with the Department. Increased production and reasonable prices to the consumer should be the leading aims of the industry to-day. The production of eggs in the Dominion is still a considerable way behind the normal demand, and the table-poultry branch remains on a comparatively small scale. While the consumer must be prepared to pay a fair price, eggs should not have to be classed as a luxury for large sections of the population during a great part of the year.

While the past year was rather a poor one as regards honey-production, owing to an adverse season in several important districts, the beekeeping industry may be said to be steadily "coming into its own" in respect of fair values for its output. Improved returns both from the local and export markets have been largely the result of improved organization. The instructional assistance afforded the industry by the Department has been systematized and rendered more effective by the development of the apiary at the Ruakura Farm of Instruction on experimental lines. Recently an important step for the betterment of the industry has been taken by the inauguration of registration of all apiaries, which will enable effective control to be maintained in regard to disease and other factors.

The movement for the promotion of scientific agriculture—practically "better farming"—in the Dominion has been definitely advanced during the year through the medium of the Fields Division, in conjunction with the Biology Section, of the Department. The acknowledged need for co-ordination and systematization in connection with agricultural research and experimental work throughout the country has materialized in an organization which it is trusted may be the nucleus of development of the greatest value in the not-distant future. Instituted on sound but simple lines, at a very moderate expenditure, the Central Development Farm, at Weraroa, has been designed as the guiding and controlling centre of the Department's activities in field husbandry. Fitting into the same organization is a system of student-assistantships, by which successive bodies of young men will be trained on practical lines giving them the knowledge necessary for the work of the fields instruction and inspection staff. This will go far towards overcoming the difficulty which frequently exists at present of obtaining suitable occupants for what should be expert positions, and of satisfying the ever-increasing demand on the part of the rural community for the services of experts in various branches. It should be clearly understood, however, that Weraroa is not an agricultural college. Rather is the conception of its training side akin to that of the noted Kew institution, which (in the sphere of horticulture) turns out yearly numbers of men, many of whom are to be found in important positions all over the world. There is no reason, however, why the training received at Weraroa by student-assistants should not be allowed to rank as practical courses in connection with a degree in agriculture taken at one or other of our University colleges.

The Department's experimental farms in other districts will operate in due co-ordination with Weraroa, although specialization in certain directions will be given scope at the former stations. It is also very probable that the fine establishment at Ruakura may be used largely in connection with the training of returned soldiers, and later on, when the country has settled down again to normal conditions, for teachers and others, in co-operation with the Education authorities. The development of the Ashburton Experimental Farm has established the Department's field experimental work in middle Canterbury on a good footing, and similar experimental or demonstration farms for other South Island districts are in view.

A very useful approach to an experimental farm proper consists in local demonstration areas of fair size, several of which are now being organized by the Department in different parts of the Dominion. An area of some 30 acres at Gore, in Southland, may be mentioned as an example. These local areas, which are more or less superseding the system of individual co-operative experiments, will be chiefly the concern of the reconstituted body of Fields Supervisors, which forms another part of the reorganization of the Fields Division effected during the year. The superseding of the old co-operative experiments will set free a considerable amount of money for the new local areas.

It will be seen that agricultural improvement and education stand to be effectively promoted by the means just outlined. It is essential, however, that the Central Development Farm should receive a strong support, the ultimate aim being increased primary production—the wealth which is needed to pay for the war. It would be a serious mistake to in any way starve the nerve-centre of the new development, which contains such great and beneficial potentialities.

As already briefly mentioned, the prolongation of the war is placing an increasing strain on the agricultural industry, the provision of the necessary labour being the principal problem to cope with. It will be for the Government, after a wide survey of the position and consultation with various authorities concerned, to indicate any necessary limits in connection with the industry's share in military service. Possibly the precedent regarding exemptions set by Great Britain might be reasonably followed by New Zealand. But in any case the time appears to be approaching when the women of the country must be called into the agricultural ranks in no inconsiderable numbers. Here also we have the example of the Motherland. Our boys leaving school must also help to fill the gaps to a greater extent than hitherto. There is also a great opportunity for retired farmers to render patriotic service in the training and superintending of such labour recruits. As regards the great primary industries proper, partial exemptions have already been granted to certain classes of workers, and similar provisions may have to be extended shortly.

In regard to the vitally important matter of refrigerated shipping and storage for dealing with our main perishable products—meat, butter, and cheese—it is satisfactory to record that the stores were cleared of accumulations of produce before the export season of 1916-17 began in earnest. The end of the period now reviewed, however, was marked by a greater blockage of produce than ever experienced before, and the position has since become more aggravated. The main causes are the war losses among the refrigerated fleet trading to New Zealand, and the diversion of a number of such vessels for food-carrying on shorter routes in order to meet the serious exigencies of the Mother-country. The tonnage recently allotted to New Zealand up to the end of September is, however, very considerable, and, while there seems little hope of the stores being cleared this year, sufficient space will be set free to enable the new season's business to open without being disastrously hampered. The wisdom of the action taken by the majority of the meat-freezing companies in extending their cold-storage accommodation has been amply demonstrated. The aggregate holding-capacity of the various works is now equivalent to between four and four and a half million freight carcasses, and further extensions are in hand at certain establishments. The dairy industry has hardly shown the same readiness in providing refrigerated storage for its output, though extensions to cheese-stores have been made recently at several ports, and others are now in hand, at Wellington in particular. It seems clear that much more must be done before the dairy industry can feel reasonably secure in relation to next season's operations. A repetition of the experiences of the past season at Wellington, with more or less casual storage for large quantities of cheese, is highly undesirable. A measure of financial support for the construction of cheese cool storage for this and certain other ports has now been decided upon by the Government.

The present position in regard to our overseas trade should cause all concerned to look well ahead and consider the best scheme of farming and production to follow under possible eventualities during the ensuing season. Questions of live-stock management are chiefly concerned, such as whether to carry over more lambs and freeze more sheep. Again, should the dairy factories make butter or cheese? and so on. A complete stoppage of shipping even for a comparatively short time would, of course, require the taking of very radical measures, and these should be worked out in advance as war emergencies are worked out by a military general staff. It appears, however, not unduly optimistic to hold that the new producing season may be commenced on fairly normal lines.

Above all things a strong all-round food-production policy should be maintained. Any suggestions for a limitation of production on the grounds of a possible stoppage of exports cannot be considered. Neither New Zealand nor the Empire is at the end of its resources in shipping or storage. With a world-wide shortage of foodstuffs among the possibilities of the near future, any slackening-off in production cannot be too strongly deprecated. The conclusion of peace, with an easing of the shipping difficulty, should find New Zealand ready as a supplier to the utmost of its capacity under prevailing conditions.

It may be mentioned that one of the most important duties assigned to the recently constituted National Efficiency Board is the investigation of the special problem arising in connection with the agricultural industry as touched upon in the foregoing remarks, and it is

hoped that their labours will help to bring about a better organization of the whole of the industries of the country. Questions of storage, shipping, and production are also receiving the close attention of the Government in conjunction with other expert advisers.

The year was marked by a great extension of the system of purchase of our leading staple products by the Imperial authorities through the New Zealand Government. The arrangement regarding meat was renewed, with a moderate increase in prices dating from the 20th October, 1915, the agreement to hold good for the period of the war and for at least three months thereafter. The Imperial Government has since assumed the ownership of all meat in store instead of f.o.b., an arrangement which is advantageous to the producers in several respects. Purchase of the wool-clip was the first new transaction. After conferences with producers' representatives, &c., at which terms were discussed, the wool was requisitioned by Proclamation dated the 21st December, 1916, on a basis of 1913-14 values, plus 55 per cent., with payment in fourteen days. Sheep-skins were purchased at fixed rates under a notification dated 1st February, 1917, and similar arrangements in regard to hides and calf-skins were gazetted on 14th March, 1917. After somewhat protracted negotiations with the producers the cheese-output was taken at a price of 9½d. per pound f.o.b., the arrangement being set forth in a *Gazette* notice dated 16th January, 1917.

The wool requisition may be described as the record commercial transaction in the history of the Dominion, the aggregate value of the season's clip being some twelve and a half millions sterling. After the inception of the arrangement for purchasing the wool (and subsequently sheep-skins and hides) it was necessary to make provision for the organization and direction of the necessary working details, and for this purpose a committee, termed the Requisitions Committee, consisting of Mr. W. G. Foster, Mr. W. D. Stewart, and Dr. C. J. Reakes (Director of the Live-stock Division of the Department), was set up. Both Mr. Foster and Mr. Stewart are gentlemen with large and responsible business interests, but they unreservedly gave their services gratuitously to the Government, and have devoted a great deal of their necessarily valuable time to the work. The magnitude of the interests involved and the very large volume of business to be dealt with have called for close attention throughout, and I desire to express my appreciation of the great value of the service rendered, and of the assistance received by me as Minister in charge, in all matters which have been dealt with by the committee. Taking everything into consideration, it can be claimed that the arrangements made for taking over wool, sheep-skins, and hides have proved satisfactory in working, and though, as might have been expected, difficulties have arisen from time to time, they have in every case been overcome successfully. In this it is realized that producers, brokers, wool buyers and valuers, fellmongers, scourers, tanners, and all concerned have almost without exception exhibited an evident desire to co-operate with the Government in assisting to attain the results achieved.

I may also here record the fact that, although handsome prices have been secured to the producers under the Government purchases as compared with pre-war values, such prices have in every case been substantially lower than those ruling in the open market for goods of the same classes as those requisitioned. No one industry alone has made "sacrifices," however. The meat-producers, for instance, have ceded just as much or more than the cheese-producers, and, moreover, have agreed to continue their present arrangement until after the end of the war. It may be noted that butter is now our only staple of first magnitude that has not come under the Government-purchase system. There are some indications that it, too, may be included in impending transactions affecting the new season's dairy-produce.

The foregoing observations do not claim to be anything approaching a complete review, however brief, of the agricultural year and interests, but merely touch on the more salient features. Mention might be made of many other subjects, but more than ever these are times for action rather than for discussion. Moreover, until a victorious termination of the war sets free the men and the money, a large number of activities awaiting attention cannot be further discussed to much useful purpose. Much information and suggestive matter will, however, be found in the reports of the Secretary and heads of Divisions and Sections which follow. My concluding word must be one of appreciation of the work carried out by the staff of the Department in all its branches, often under heavy handicaps due to war conditions. I also extend appreciative greetings to those many members of the Department whom duty has called to army service, and add my homage to the memory of those of them who have made the supreme sacrifice.

W. D. S. MACDONALD.

REPORT OF THE SECRETARY OF AGRICULTURE, INDUSTRIES, AND COMMERCE FOR THE YEAR ENDED 31st MARCH, 1917.

Wellington, 4th August, 1917.

The Hon. Ministers of Agriculture and of Industries and Commerce.

I BEG to submit the annual reports of the following officers of the Department for the year ended 31st March, 1917: The Director of the Live-stock Division; the Director of the Fields Division; the Director of the Horticulture Division; the Director of the Dairy Division; the Chemist; and the Biologist. These documents give an excellent review of the work for the year, and are of such reasonable brevity as to render a *résumé* by me unnecessary. I shall therefore limit my own report to a few matters that seem to me of outstanding importance or significance. As usual these will be confined more or less to the Department's own operations, on the understanding that more general questions affecting our agriculture, industries, and commerce will be referred to in the Ministerial statement.

The war-pressure has, of course, affected our work very materially, especially as the number of officers on active service has steadily increased; but thanks to the self-denying efforts of the staff almost all the work has, with some assistance from temporary officers, been kept going efficiently. In these circumstances it would be unreasonable to expect much in the way of new developments, but nevertheless some notable changes have been initiated during the year.

WERAROA CENTRAL DEVELOPMENT FARM AND ALLIED MATTERS.

The most important of these changes is the conversion of Weraroa Experimental Farm into a Central Development Farm for the Dominion. It is intended to carry on at that institution the principal research and experimental work of the Department, mainly in connection with pasture-formation, field-cropping, and sheep and dairy husbandry for the present at least, and to diffuse from this centre, through the other experimental farms and the instructional officers of the Fields Division, to farmers throughout the Dominion the benefit of the results of such researches and experiments as are brought to a successful conclusion. It is further proposed to carry on at the Central Development Farm the training of a number of young men of good general education for instructional positions in this Department or under the Education Boards, and for research work. The principal feature of this training will consist in giving the students full opportunity for working in the field or laboratory in conjunction with the resident or visiting officers engaged in research or experimental operations. There will also be definite series of lectures by the officers, and the students will, of course, be grounded in the ordinary farming practices. It is expected that young men, after completing a course at Weraroa and gaining a few years' actual experience in instructional work under suitable oversight, will be fitted to take an active part in guiding aright the agricultural development of whatever part of the Dominion they may be located in. To provide a suitable staff for the Central Development Farm the headquarters of the Fields Division, and the whole of the Biology Section, of the Department have been transferred to Weraroa.

As already indicated, the activities at the Central Development Farm will in the meantime be mainly in connection with pastures, field crops, and dairy and sheep husbandry, and will therefore provide a training specially suitable for officers of the Fields and Live-stock Divisions; but as there is at present no specific provision for training in veterinary science, the higher branches of dairy factory and laboratory work, or advanced horticulture, it will be seen that if the training of scientific officers for veterinary work, or for dairy factory or horticultural instruction, is to be undertaken in New Zealand further provision will have to be made, either by extending the scope of the Central Development Farm or by establishing separate institutions. While a certain amount of economy during the earlier stages of training would result from having all these branches combined at the Central Development Farm, I consider that on the whole it would be better to train officers for these branches entirely separately.

For veterinary work the best arrangement will no doubt be to institute a special veterinary school, probably in connection with the medical and dental schools at the Otago University. Failing this we must continue to draw our veterinarians from veterinary schools beyond the Dominion, whose courses naturally have no particular bearing upon New Zealand conditions, and whose graduates will therefore require some years of experience in this Dominion before reaching their full degree of usefulness.

The training of Dairy Instructors could probably be best arranged for by drafting sufficient students from the Central Development Farm into the service of some of the best-equipped dairy factories, and when they had had sufficient training in actual dairy-factory work giving them a course at a special dairy laboratory to be established at the Central Development Farm or elsewhere.

Horticultural experts should, I think, be provided for by the establishment of a central horticultural station on similar lines to the Central Development Farm, but with orcharding, market-gardening, and apiculture as its objects.

In the case of each of these institutions students should undergo a preliminary science training of, say, two sessions at a University college.

It will be observed that these proposals would make provision for the training of experts in most of the principal branches of agriculture suitable for New Zealand, but that the course would be too long and too expensive—either to the Government or to the student—in the case

of agricultural workers other than experts. To provide for the training of farm managers and foremen for private farms it would be necessary to give effect to the recommendation of the General Council of Education in favour of the establishment of farm schools, at which pupils would be taught how and when to carry out the ordinary farming operations, but would not be trained to any great extent in the sciences underlying such operations.

EXPERIMENTAL FARMS AND AREAS.

The establishment of experimental farms or smaller experimental areas in parts of the Dominion not yet catered for in this way also demands attention. Negotiations are already in progress in regard to an experimental farm for the west coast of the South Island, and something definite in this direction is certainly called for in the case of Otago. Concerning smaller experimental areas, to be managed by the Department in conjunction with local committees, the Department is anxious that considerable development should take place, and negotiations with local committees have been begun in several localities. It is felt that areas of this class will serve a much more useful purpose than the more numerous co-operative experiments with individual farmers that were so extensively carried out during the past decade.

SOIL SURVEY.

Another matter that should be pushed on as speedily as possible, in order that the Dominion may be thoroughly equipped for greatly extended production after the war, is a soil or agricultural survey of the country. In brief, this means the mapping of New Zealand into areas having similar characteristics from the agricultural point of view, and when completed in regard to any district it would enormously facilitate the country's development, seeing that the Department would be in a position to conduct its researches and experiments with a full knowledge of how far they would be applicable to places other than those at which they were carried out. I am glad to state that, notwithstanding the adverse conditions prevailing, the Department's Chemist has made a start with this work in certain districts, and every effort will be made as opportunity offers to provide him with facilities for continuing and extending this undertaking.

WEEDS SURVEY AND CONTROL.

An efficient weeds survey of the Dominion is also greatly needed to give our headquarters officers a comprehensive grasp of the incidence of the several plant pests that are so greatly retarding the development of agricultural production. This work has now been put in hand, and will be carried on as rapidly as possible.

Upon completion of the weeds survey, research and experimental work with a view to bringing practical methods of control before the farmers will be undertaken on a considerable scale, it being evident that the mere annual cutting of weeds is not the ultimate solution of the problem, and is, moreover, entirely impracticable in many parts of the country.

Nevertheless it should not be overlooked that a great deal of good work has been done in the way of cutting weeds to comply with the Noxious Weeds Act, and it is safe to say that much land is now producing heavily which, had it not been for the enforcement of the Act, would still be overrun with noxious growths. It is recognized that during the war farmers are in many cases severely hampered in their efforts to meet the requirements of the Inspectors under the Act, and these officers are therefore using the utmost discretion in this matter, but to comply with the suggestion that has been freely made that the Act should be entirely in abeyance during the war would be quite a mistake, as much of the good work already accomplished would undoubtedly be sacrificed.

RABBIT-CONTROL.

The position is much the same in regard to rabbit-control. It is impossible for the Department to contemplate permitting any serious increase of rabbit infestation, and the Inspectors must, while fully sympathizing with the difficulties of landholders, take all steps necessary to prevent any abnormal increase. The trapping industry in Otago and Southland is now quite a large concern, and undoubtedly affords remunerative employment to a considerable number of men and to a large amount of capital, but it is also certain that both the men and capital would be better occupied in developing the agricultural and pastoral interests. To put the matter quite plainly, the Dominion would undoubtedly be better off if the export of rabbits were absolutely prohibited. There is no doubt that, in the districts where commercial trapping obtains, so long as the present profits and employment are afforded by trapping, serious efforts to bring the pest under complete control will only be made by the most enlightened and energetic landowners, whereas many others will remain content to see rabbits flourish so long as they yield a measure of employment and revenue. While I do not advocate that any drastic steps should be taken during the war, I feel that it is only a matter of time when it will be recognized that the trapping industry is against the best interests of the district in which it is carried out.

REFRACTORY LANDS.

Another matter to which very serious attention will have to be given as soon as conditions permit is the development of the more difficult lands of the Dominion, such as the pumice areas in the middle district of the North Island, the gum lands of the Auckland District, the immense montane tussock areas in the South Island, and the pakihi lands of Westland. Some work has already been done in connection with these huge areas of comparatively unproductive country, but the matter undoubtedly warrants more thorough investigation than has yet been found practicable.

GRASS-SEEDS.

The high price of grass-seeds is, I am afraid, tending to induce farmers to use inferior supplies. This is altogether unfortunate, especially in the case of permanent pastures, and farmers would certainly be well advised to incur additional expense for seeds rather than to run the serious risks involved by the use of inferior samples.

DAIRY FARM INSTRUCTION.

The matter of the cleanliness of the milk-supply to many of our dairy factories is still causing grave concern, and it would certainly be to the benefit of all interested in the business if an adequate system of instruction and inspection of the premises of dairy-factory suppliers were in force. Finance is, however, the chief difficulty, and I believe that the time has come for the factories to face the position and intimate to the Government their willingness to provide the money for this work. The most convenient way in which this could be done would be by means of a charge for grading dairy-produce for export. Quite a small rate, say 3d. per package, would yield a sufficient sum to warrant the Government in establishing a comprehensive system of instruction and inspection of milk-suppliers' premises.

FINANCING RURAL ENTERPRISES.

If New Zealand's production of agricultural produce of all kinds is to be largely extended after the war, as will be so eminently desirable in view of the increasing national debt, I am convinced that it will be necessary for the Government to have power to lend money for the establishment of enterprises designed to promote production. Such provision already exists in the case of the fruit-preserving industry, and there seems no reason to doubt that similar assistance should be rendered in the case of all kinds of co-operative or other semi-public agricultural undertakings. I strongly recommend that legislation should be introduced to enable the Government to make advances to co-operative companies and to proprietary concerns in suitable circumstances for the establishment of such businesses as meat-works, dairy factories, cold stores for poultry produce, lime-works, works for the utilization of waste timber, wool-scouring plants, and so on.

FRUITGROWING INDUSTRY.

An important undertaking during the past year was the registration of all orchards, large or small, throughout the Dominion. This step was necessary to facilitate the collection of the amounts due under the Orchard-tax Act of last session, but will be found of great assistance to the Department in connection with the control of orchard pests, especially after the war, when it is hoped that the staff of instructors will be sufficiently strengthened to enable the lists compiled from the register to be fully utilized.

Notwithstanding the large increase in the area of productive orchards, the local market was able to absorb the whole of the fruit brought forward. This was to some extent due to the unfavourable season, but it is abundantly evident that the local market can be enormously developed, and that no serious anxiety need be felt should the export of fruit be impracticable for a considerable time to come. Apparently the best means of increasing the local consumption of fruit would be to arrange for the grocers to carry supplies of suitable fruits in cartons of, say, 5 lb. or 10 lb. If the grocers were supplied direct from central packing-sheds the cost of distribution would be greatly reduced, and I am convinced that if apples, for instance, were delivered by grocers in the cities in the ordinary course of their business at, say, 4d. per pound a very large demand would be experienced, and there is no doubt that this would enable both growers, packing companies, and grocers to obtain thoroughly payable prices.

BEEKEEPING INDUSTRY.

Arrangements have now been completed for the registration of all apiaries, thus compelling the box-hive man, who still lingers in out-of-the-way places, to disclose his whereabouts, and to either bring his operations into accord with the law or discontinue them altogether. A definite beginning has been made with experimental work for the benefit of beekeepers, and it is proposed to develop this as opportunity offers. The work of inspection and instruction, on which four Apiary Instructors have been engaged for several years, is now yielding good results, and a hopeful tendency towards co-ordinated effort to improve the position of the bee industry is developing amongst those engaged in it. The National Beekeepers' Association and the New Zealand Co-operative Honey-producers' Association are both doing good work, and their operations will materially assist the Department's efforts to place beekeeping on a thoroughly sound basis. According to present indications the local markets will ere long be fully supplied with honey at prices fair to both producer and consumer, and the export trade will soon attain considerable dimensions.

POULTRY INDUSTRY.

The poultry industry, too, shows every sign of coming into its own in the near future. Leading men in the business are now taking an active and wisely directed part in the affairs of the New Zealand Poultry Association, and that organization may be relied on to do its share in bringing poultry-keeping into the important position it ought to occupy amongst us. An increase in the Department's instructional staff, and legislation to give these officers some control over the sanitary conditions under which poultry is kept, are now greatly required and would do much to help matters forward. A further difficulty in advancing the poultry industry is the fact that only a few engage in it as their principal business, the great majority treating it

as a side-line unworthy of serious attention. That poultry should be kept on practically every farm as an adjunct to other operations is clearly desirable, but what is needed is that farmers should recognize that a flock of well-bred birds may be made to pay handsomely if some suitable person—a woman or a partially disabled man will often prove satisfactory—is encouraged to study proper methods of management as advocated in the Department's monthly *Journal*; to give the birds a reasonable amount of consistent attention; to join an egg circle; to attend the association's annual conferences; and to otherwise identify herself or himself with the uplifting of the industry. If this were done generally, and if the unfair competition of preserved yolks and desiccated whites from cheap-labour countries were stopped, proper use made of the advantages of cold storage, and sensible methods of preparing cockerels and discarded layers for the market adopted, prohibitive prices for eggs and poultry on the local markets would disappear, and regular supplies of both these commodities at fair rates would be assured to the whole population. Thus a valuable step towards reducing the cost of living would be achieved, while at the same time a very large number of farmers would find their incomes appreciably augmented.

HEMP INDUSTRY.

The hemp industry has experienced an exceedingly profitable year, prices having reached a level hitherto undreamt of. The Government grading of hemp, tow, and stripper-slips has continued to give general satisfaction. During the year a special officer has devoted a large amount of time to an investigation of the insect pests and diseases affecting the phormium areas, and some valuable information has been obtained and published. The investigation will be continued during the coming season.

VETERINARY ASSISTANCE.

A matter that will call for further attention after the war is the lack of veterinary assistance in the more sparsely populated districts. The solution that will probably be adopted is the subsidizing by the Government of private veterinarians willing to settle in such districts. This scheme has already been put into operation in one locality, and has given general satisfaction by enabling the farmers to obtain veterinary services at reasonable cost and without undue delay.

PUBLICATIONS.

Another work that I should like to see carried out is the preparation of a practical official handbook for farmers. A great deal of the necessary information is already embodied in past issues of the *Journal of Agriculture*, but its compilation and completion cannot well be undertaken under present conditions. The matter will, however, be kept in view. The *Journal* has continued to be of immense assistance to the industry, and many appreciative testimonials, both generally and in specific instances, have been received.

HEADQUARTERS BUILDING.—STAFF.

Before concluding I should like to point out the extreme inconvenience under which the Department carries out its work owing to the lack of a suitable headquarters building. The staff is at present scattered over half a dozen buildings, an arrangement that has only to be mentioned to ensure its condemnation. I trust that when matters again become normal this serious lack in the agricultural equipment of the Dominion will be remedied.

The staff in general is entitled to the highest praise for its work during the year. Its multifarious and onerous duties have been carried out under extremely adverse conditions in a manner that merits the warmest commendation.

F. S. POPE, Secretary.

DEPARTMENTAL ROLL OF HONOUR.

Killed.

Emerson, P. T. (Lieutenant).
Flower, W. E. F. (Lieutenant).

Hunter, J. (Private).
Primmer, J. H. (Captain).

Died of Wounds.

Kirkland, J. (Private).
Robinson, A. J. (Corporal).

Waugh, G. N. (Captain).

Wounded.

Cullen, T. L. (Sergeant).
Edgar, P. M. (Major).
Gill, A. M. (Private).
Hannah, W. H. (Private).
Holm, J. W. (Private).
Howard, E. C. (Captain).

Low, J. (Private).
Lyford, F. A. (Private).
McLew, W. H. (Sergeant-major) (twice).
Mitchell, G. G. M. (Sergeant) (three times).
Spragg, C. R. (Major).
Storey, A. W. (Private).

Military Medal.

Mitchell, G. G. M. (Sergeant).

APPENDIX.

LIVE-STOCK DIVISION.

REPORT OF C. J. REAKES, D.V.Sc., M.R.C.V.S., DIVISIONAL DIRECTOR.

Wellington, 20th June, 1917.

The Secretary of Agriculture, Industries, and Commerce.

FOLLOWING is a report on the work of the Live-stock Division during the past year.

C. J. REAKES, Director, Live-stock Division.

INTRODUCTION.

The duties assigned to this Division have been conducted largely upon routine lines, the depletion of the staff, owing to the number of its members being absent with the New Zealand Forces, preventing the undertaking of new investigations or additional measures of disease-control. Further, the undertaking of additional work of what may be termed an educational nature, both in connection with the breeding and care of stock as well as the prevention and control of disease, has had to be postponed, though the desirableness of it is apparent in some directions. It is hoped, however, that after the termination of the war new spheres of activity may be undertaken, and an endeavour made to increase the usefulness of the Division.

During the latter part of the year my own time has been principally occupied by special duties in connection with the requisitioning of wool, sheep-skins, and hides.

LIVE-STOCK.

The health of stock generally for the season was good, there being no outbreaks of disease of any serious nature, such trouble as occurred having been due principally to dietetic causes influenced by the climatic conditions prevailing in various districts.

The lambing was good generally. The estimated percentage of lambs reared from the number of ewes put to the ram was 85·8 per cent. for the North Island, and 80 per cent. for the South Island, representing a total of 10,733,579 lambs reared, or about 200,000 in excess of the previous year's estimate. In some districts affected by excessive rainfall there has been considerable difficulty in fattening lambs, and the ravages of internal parasites may be expected to cause some trouble during the coming winter.

Statistics collected during the year show that the apprehension expressed in a former report as to a possible shortage of cattle is minimized. The number of cattle recorded in the Dominion in January, 1916, was 2,329,292, being an increase of 309,121 on the figures shown when the statistics were last collected in 1911.

The number of cattle, exclusive of calves, slaughtered for export during the last four years is as follows :—

Year ended 31st March—	Bullocks and Heifers.	Cows.	Bulls.	Total.
1914	63,378	36,364	9,937	109,679
1915	112,414	58,247	11,459	182,120
1916	104,497	94,314	12,520	211,331
1917	127,446	103,877	11,953	243,796

ANIMAL-DISEASES.

Horses.

The past year has been remarkable for the small amount of diseases reported. Strangles has been unusually quiescent, whilst ringworm has almost disappeared.

Stringhalt.—This trouble, referred to in my last annual report as being under investigation, suddenly disappeared, and comparatively few fresh cases have been reported. The disease is undoubtedly that termed "Australian stringhalt," and the careful observations made, together with the experimental work carried out, all clearly indicate that it is not in any degree contagious, but is apparently of dietetic origin, though the causative agent remains undetermined. Except in those acute cases where death occurred soon after the onset of the trouble, recovery came about spontaneously after the lapse of some months, the animals being apparently little or none the worse for their experience.

Cattle.

Contagious Abortion.—Research work in all parts of the world has thrown some new light upon this insidious disease, though there is yet much more to be learned. The methods of treatment recommended by the Department are still the best known, though there are indications that a form of treatment by a vaccine may be elaborated to the extent of proving of value. At present the best that can be said for this treatment is that it appears to be useful as a preventive when applied to empty cows sometimes before service. The best available up-to-date information has

been obtained, and vaccine is being prepared at the Veterinary Laboratory with a view to giving the treatment a practical trial under New Zealand dairy-farm conditions. In its present form it is not a treatment which can be satisfactorily applied by farmers themselves, and it is evident that more research and experimental work is necessary before effective and practicable means of coping with the disease, better than those in use of late, can be recommended for general application by dairy-farmers themselves.

Contagious Mammitis.—Reports and correspondence dealing with this disease continue to reach the Department, and, whilst a large number of milk specimens forwarded to the Veterinary Laboratory for examination have proved to be of a non-contagious nature, sufficient evidence is forthcoming to warrant a continuation of strenuous efforts to combat the disease.

Blackleg.—In the Taranaki District 60,440 calves were vaccinated during the past year as a preventive measure against this disease, the work having been successfully carried out by the Inspectors of Stock in the different districts; 133 calves were reported as having died of the disease during the same period. In the Auckland District 51,828 calves were vaccinated, and 293 deaths were reported, making a combined total of 112,268 successfully vaccinated and 426 deaths before and after vaccination. There are no special suggestions to offer regarding the position in Taranaki, the disease there being well in hand, whilst the quarantine boundaries and the system of vaccination are working satisfactorily. In the Auckland District the position is somewhat different, and calls for comment. The dairy industry in this province has so greatly advanced during the past few years as to considerably increase the number of calves reared, and with the advent of more susceptible animals the disease, having favourable opportunities for spreading, has made its appearance in unexpected places. The declaration of infected areas could only be tentative until information was forthcoming indicating with some degree of finality the extent of ground likely to be infected, whilst meantime the Inspectors were doing their very best to meet the requirements of the case. The position has now assumed a definite aspect, and blackleg must be recognized as established firmly in the province. Additional steps must be taken to prevent its further spreading, and recommendations are under consideration.

Sheep.

Parasitic Gastritis has been somewhat more than usual in evidence, a considerable mortality having been reported, and, owing to the prevalence of autumn rains, the present indications are not favourable for the coming winter. This trouble, however, is so well known to stockowners that, no doubt, they will use every precaution to prevent its onset. A supply of dry, nutritious feed is of great assistance in sustaining the condition of affected animals and in enabling their system to better cope with the attacks of the parasites.

Facial Eczema continues to be reported from various centres, but the direct losses have been small. Prompt change to suitable short pasture immediately the first cases of the disease are noted is of the greatest value in restricting the trouble arising from it.

Tuberculosis.

While New Zealand is in a very favourable position compared with most other stock-breeding countries in the matter of the extent of the prevalence of tubercular disease, it is a matter for regret that a slight increase has been noted during the year in the percentage of affected cattle and pigs found among those coming under the observation of Inspectors at meat-export slaughter-houses and public abattoirs. The increase is not great, amounting to 0·48 per cent. in cattle and 0·47 per cent. in pigs as compared with last year.

It is possible that one factor in this position may lie in the additional work which has been thrown upon Veterinarians and Inspectors of Stock in connection with the various additional activities of the Government consequent upon operations connected with the war, combined with the reduction in the available staff brought about by several skilled officers being absent on active service. During a portion of the year a good deal of the time of the officers was taken up in connection with the purchase of horses for the use of the troops, and in addition the services of some Inspectors have been utilized to a certain extent in connection with the requisition of wool, sheep-skins, &c. It is very certain that in the time at their disposal for their regular duties no relaxation of energy or vigilance has taken place. It is evidence, however, that the campaign waged against this troublesome and costly disease must be vigorously continued, and in this the co-operation and assistance of stockowners—which has not been lacking in the past—is necessary in order to assist the Government to reduce the annual loss suffered on account of it.

Bush-sickness Investigation.

Further progress has been made in this investigation on the lines noted in last year's report, and in addition new work has been done. The result of the year's operations is satisfactory, seeing that valuable further knowledge has been gained concerning the practical methods to be adopted in coping with the trouble. Also, grazing operations from a profit-making point of view have been conducted with good financial results. Mr. B. C. Aston, Chemist to the Department, has continued to co-operate in the investigation. Following are particulars concerning the work carried out:—

Experimental Work.—1. Chemically treated drinking-water experiments: These were concluded, the amount of success which resulted not being sufficient to warrant continuance along the lines on which the experiments were laid down, viz.: (a) Treatment of cattle on undressed pasture with a fixed portion of superphosphate dissolved in the drinking-water supplied in a trough; (b) treatment of cattle on phosphate-dressed pasture with a fixed quantity of superphosphate in the drinking-water; and (c) treatment of cattle on phosphate-dressed pasture with a fixed quantity of phosphate of iron in the drinking-water. It was evident in experiment (a) that while the

treatment was beneficial it was not sufficiently so to enable the animals to be kept healthy for more than a year on untreated land; while in (b) and (c), which were conducted under conditions parallel to each other, it was obvious that that in which iron phosphate was used in the drinking-water was the more successful.

2. Experiments with two lots each of six yearling heifers, placed in October, 1915, on (a) untreated pasture, with a lick provided, and (b) on pasture topdressed with a phosphatic manure, also with a lick. These resulted as follows:—

(a.) The heifers after some months began to lose condition, and at the expiration of a year their loss of condition was sufficiently marked to necessitate their removal from the bush-sick area. (b.) Of the six heifers, three are still perfectly healthy, and have grown and developed normally after the expiration of eighteen months. Two others accidentally got in calf, and, together with another, went off in condition. Two of the last-mentioned three had to be sent away, but the third remains, and though it is not in good condition appears to be holding its own. (N.B.—In June, 1917, the three healthy animals are still doing well.) It is shown by experiment (b) that there is considerable hope of success along this line of research, and further experiments are being made with an improved lick.

3. Experiments in calf-rearing: The calves mentioned in the last annual report under paragraph 4 all died, and a modified treatment is being instituted this year, in which a powder containing phosphates, iron, and sugar is dissolved in the skim-milk on which they are fed. This treatment has proved successful up to a certain stage, but the season this year is acknowledged to be one of the worst on record as regards bush sickness, and owing to the continuous spring rains and consequent rank pasture it is considered an achievement to have reared any calves at all, most of those in the district having succumbed at very early date. At present there are nine healthy calves remaining out of the original twelve.

4. Sheep experiments: Of the twelve ewes put on the iron (spent oxide) paddock in May, 1915 (see report of 1916), four proved to be in lamb and two died. The lambs died by February. The second season the surviving ewes were not put to the ram. At the end of the second year on this paddock only three remained healthy. This experiment is notable as showing the efficacy of iron dressings in keeping grown sheep healthy for a much longer time on affected country than otherwise would be possible.

Profit-making Operations.—Grazing operations have been continued successfully. For instance, in March, 1916, fifty-one steers were bought at a cost of £481, and in June these were sold for £590. In October forty-two dry cows were bought at an average price of £7 17s. 4d. per head. Of these twenty were sold in March at £10 17s. per head. Of the remaining twenty-two some proved to be in calf and are now rearing their calves, while six others are fat and ready for the butcher. Other animals which had to be off the farm were sold at a profit. Thus six heifers (bought October, 1915, for £4 10s. per head) were sent to Ruakura for a short time in October, 1916, and improved and were sold at £9 16s. 8d. Other experimental animals which proved refractory to medicinal treatment were sold at a profit after being grazed outside for some time.

Milking.—Thirteen cows were successfully milked throughout the past season. Of these, two mature cows purchased in the spring of 1915 have been milking for two seasons without drenching, but having access to a lick and to phosphate-dressed pasture. Two others (reared on the farm and now nearly four years old) had similar treatment excepting that one had a short treatment of drenching with syrup of iron phosphate. Both are healthy and well. The remaining nine were mature cows purchased at the beginning of the season. These had no lick, but were run on phosphate-dressed pasture. All these cows are now (June, 1917) perfectly healthy. In cases where stock was purchased it has always been from an area outside that considered bush-sick.

INSPECTION OF MEAT.

The matter of maintaining the meat-inspection staff at sufficient strength has been a difficult one, as, in addition to its strength having been seriously depleted through previous enlistments in the Expeditionary Forces, the completion of a number of new meat-export slaughterhouses which commenced operations during the year increased the difficulty of the position in these abnormal times. Further additions to the staff were therefore necessary, a number of those taken on being returned soldiers; and I am pleased to say that the year's work has been satisfactory, reflecting credit on the staff engaged on it. Following are the new meat-export slaughterhouses:—

Westfield Freezing Company (Limited), Auckland.

Feilding Farmers' Freezing Company (Limited), Feilding.

Wairoa Farmers' Co-operative Meat Company (Limited), Wairoa.

New Zealand Refrigerating Company (Limited), Imlay, Wanganui.

Taranaki Farmers' Freezing Company (Limited), New Plymouth.

North Canterbury Farmers' Co-operative Freezing Company (Limited), Kaiapoi.

Thomas Borthwick and Sons (Australasia) (Limited), Belfast.

The undermentioned works are in course of construction:—

East Coast Co-operative Freezing Company (Limited), Tauranga.

Wellington Meat Export Company (Limited), Kakariki, Marton.

The following are the numbers of each class of stock slaughtered under direct inspection during the year, 1st April, 1916, to the 31st March, 1917: Cattle, 328,708; calves, 19,396; sheep, 3,341,910; lambs, 3,411,621; swine, 153,444. With the exception of cattle, which show an increase of 20,403, these figures show a decrease in the number slaughtered of each class compared with the corresponding figures for the previous year, the decreases being—sheep, 389,733; lambs, 653,479; calves, 14,374; and swine, 16,271. Assuming that the decrease in the number of lambs slaughtered is due to a greater number of ewe lambs being carried over, this will be of advantage to the Dominion rather than otherwise.

The following table indicates the destination of the dressed carcasses, those animals slaughtered at abattoirs being principally for local consumption, and those slaughtered at meat-export slaughterhouses being (except in the case of swine) principally for export :—

	At Abattoirs.	At Meat-export Slaughterhouses.	At Bacon-factories.
Cattle	85,432	243,276	...
Calves	14,247	5,149	...
Sheep	524,999	2,816,911	...
Lambs	66,532	3,345,089	...
Swine	45,107	28,848	79,489

At ordinary slaughterhouses the stock killed was as follows: Cattle, 56,421; calves, 1,210; sheep, 259,374; lambs, 20,322; swine, 14,425.

In addition to the above, 34,965 carcasses of pigs were killed and dressed by farmers under the exemption clause of the Slaughtering and Inspection Act, and the dressed carcasses were inspected in butchers' shops and small bacon-factories.

All meat sold in butchers' shops for human consumption within the Dominion is slaughtered and dressed in licensed slaughterhouses only. No premises are licensed which do not conform to the requirements of the Act and regulations thereunder. Even in the most remote parts of the country cleanliness and sanitation are enforced in the local slaughterhouses, while inspections are made at frequent intervals.

INSPECTION OF CITY AND TOWN MILK-SUPPLIES.

The milk-supply of cities and towns in the Dominion is wholly derived from registered dairies conforming to the requirements of the Dairy Industry Act, all of which are under inspection by a trained staff, who, in addition to their regular inspections of dairy cows and dairy premises, procure and submit milk-samples for bacteriological examination, and also apply the tuberculin test to any animals suspected of showing suspicious indications of tuberculosis. Cows which are clinically diagnosed as suffering from tuberculosis, no matter whether the udder is involved or not, are at once condemned and destroyed.

THE VETERINARY LABORATORY.

The various operations carried out at the Wallaceville Laboratory have been continued, though on account of the depletion of the staff brought about by enlistments no new investigation work has been undertaken, the energies of the remaining staff having been directed to the current work necessary for controlling and reducing disease conditions among the live-stock of the Dominion. Included in this was the examination of a number of samples of milk taken from herds supplying cities and towns, these examinations being undertaken principally from the point of view of determining whether any tubercular infection was present in the milk. It is very satisfactory to note that the results have been invariably good from this point of view, thus indicating that the work of the outside inspection staff continues to be carried out effectively and thoroughly in the matter of keeping these dairy herds clear of those forms of tubercular disease which are liable to cause the milk-yield to become contaminated.

Work on the Laboratory farm has been carried on satisfactorily, and, considering the fact that the farm has been largely utilized as a hospital for sick or injured horses belonging to the Defence Department, and also for accommodating experimental animals, the results of the year's operations have been financially successful.

QUARANTINE STATIONS.

Notwithstanding increased freights and shortage of shipping facilities, importations of stud animals have been well maintained. A commodious new building containing loose-boxes for ten head of cattle, together with a feed-room, has been erected at Somes Island, while the new rain-catchment water-supply system is about completed at Quail Island, all efforts to obtain a water-supply from other sources having failed. Much good work towards improving the condition of the land for stock-carrying purposes has been carried out at Motuihi Island. Interned enemy aliens and prisoners of war are still quartered at Motuihi and Somes Islands, and, when practicable, the services of some of them have been utilized for farm-work, roadmaking, and other permanent improvements.

IMPORTATION OF ANIMAL-MANURES.

The arrangements in connection with the inspection of manure-sterilizing in both the Australian Commonwealth and India continue to be satisfactory. Supplies from Australia have decreased nearly 50 per cent. This is mainly due to inability to obtain freight for the material treated under supervision. In the case of India importers have been more fortunate in obtaining shipping-space, and the imports have in consequence increased—much in excess of the shortage from Australia.

SHEEP-DIPPING.

Although the great majority of sheepowners dip thoroughly and effectively, there is still considerable laxity by a small percentage of owners in some districts. As a result, however, of the continued advice which has been given by the Department, and the pressure which has been brought to bear upon those exposing undipped sheep for sale, a steady improvement is apparent, and will no doubt be maintained. By careful mustering and strict compliance with the manufacturers' instructions accompanying the dipping-material there should be little difficulty in keeping the flocks clean.

In cases where sheep exposed for sale have been found by the Inspectors of Stock to be affected with lice they have been ordered to be dipped, and prosecutions have been instituted against the owners.

THE POULTRY INDUSTRY.

The poultry industry has made a marked recovery from the set-back it received in 1915, caused by a sudden advance in the prices of fowl-feed without a corresponding increase in the price of eggs and poultry, which resulted in excessive culling and consequently decreased production. With short supplies of eggs and poultry and an increased demand prices for these products advanced considerably, while on the other hand prices of feed are slightly reduced. The industry may therefore now be again regarded as profitable to those concerned.

Recognizing the shortage of wheat for fowl-feed, a series of feeding tests were initiated at the Department's poultry-station at Milton by utilizing lucerne-chaff, finely cut or ground into meal, in conjunction with bran, oats, and maize. This industry was found to be in every respect satisfactory. Full particulars of these tests have been published in the Department's *Journal* (May and June, 1916, and June, 1917).

The sales of poultry and eggs for breeding purposes from the Department's two poultry-stations were as follows: Milton, 1,333 settings, 628 birds; Ruakura, 1,488 settings, 418 birds.

In order to demonstrate the possibilities in fattening or properly priming off ordinary store poultry, a number of cockerels were purchased under competition at one of the weekly auctions at Christchurch. These were taken to the Department's reserve at Quail Island, where they were fattened. After twenty to thirty-one days' feeding the birds were again offered for sale at the auction mart, and returned, after deducting cost of feeding, a profit of 92 per cent. over purchase price. (See *Journal* for July, 1916.) The results are a striking illustration of the value of priming poultry before marketing, and also of the money lost to the poultry-keepers of this country by failure to treat their birds for market in a proper manner. Further tests are to be carried out in this direction.

The Poultry Instructors have done good work, and their assistance and advice is appreciated and put to practical use by poultry-keepers. Their services have also been largely availed of all over New Zealand as judges at poultry shows.

PURCHASE OF HORSES FOR THE NEW ZEALAND FORCES.

Further supplies of horses for use with the Expeditionary Force and in camp were purchased during the year, the animals obtained being of good stamp and well fitted for the work required of them. That there was, and still is, an ample supply of horses in the Dominion is shown by the fact that not only were the last purchases obtained at no advance in price, but they were of continued good quality, the last shipment sent being quite the best from this point of view.

The total number of horses purchased up to date is 9,347. The average price paid was £22 ls. for artillery and £17 ls. 10d. for mounted infantry horses. Government Veterinary Officers took some part in these purchases, but the greater portion of the work was done by Inspectors of Stock, and the thorough and efficient manner in which this duty was performed is much appreciated.

MEAT-SUPPLIES FOR THE IMPERIAL GOVERNMENT.

The arrangement under which all meat available for export was taken over on behalf of the Imperial Government was continued during the year. In view of altered conditions, a new schedule of prices was agreed upon, these being as follows:—

	Per lb.
Wethers, first quality, 72 lb. and under	5 ³ / ₈ d.
„ „ over 72 lb. and up to 85 lb.	5 ¹ / ₈ d.
„ „ over 85 lb. and up to 98 lb. (subject to special approval by the Inspector)	4 ⁷ / ₈ d.
„ second quality	5 ¹ / ₈ d.
Ewes, first quality, 72 lb. and under	4 ⁷ / ₈ d.
„ „ over 72 lb. and up to 85 lb.	4 ³ / ₈ d.
„ second quality	4 ⁶ / ₈ d.
Lamb, specially prime and Canterbury quality, 42 lb. and under	6 ³ / ₈ d.
„ first quality, 42 lb. and under	6 ³ / ₈ d.
„ „ over 42 lb.	6 ³ / ₈ d.
„ second quality	6 ¹ / ₈ d.
Beef, prime ox	5d.
„ second and heifer	4 ³ / ₈ d.
„ boning in quarters	4 ¹ / ₈ d.
„ cow, prime	4 ³ / ₈ d.
„ „ second	4 ¹ / ₈ d.
„ boneless	5 ¹ / ₈ d.
Mutton, legs	6 ³ / ₈ d.
„ shoulders	5 ³ / ₈ d.
„ loins	5 ³ / ₈ d.

In connection with this requisition those officers of the Division engaged in meat-inspection at freezing-companies' establishments had a large share in carrying on the necessary work, they not only maintaining supervision over the grading at each works, but also checking and certifying to the various shipments invoiced to the Imperial Government. Considering the variety of duties now entrusted to these officers, and the strenuous nature of their work during the busier months of the year, they carried out their responsibilities efficiently, thus contributing in no small degree to the general success of this portion of the responsibilities accepted by the Government in connection with the war.

Wool.

The clip this season was a good one, the wool being in exceptionally good condition.

In early November the Imperial authorities intimated that it was proposed to requisition the whole of the season's clip, and after some negotiations a schedule of values was agreed upon, and steps were taken to make the necessary arrangements for valuing and taking over the wool. A staff of expert valuers was appointed, valuation centres were fixed, and the whole organization was quickly got to work, and has worked most satisfactorily throughout the season, thanks to the capable manner in which the valuers carried out their duties, and also to the efficient and thorough management of the wool-brokers throughout the Dominion in the handling of the wool. The schedule of classes and values is as follows:—

Superior merino combings	..	..	..	..	from 12d. to 14½d.
Medium to good merino	..	..	..	..	9¾d. „ 11½d.
Inferior merino	..	..	..	..	8½d. „ 9½d.
Superior half-bred	..	..	..	..	12d. „ 14d.
Medium to good half-bred	..	..	..	..	9¾d. „ 12d.
Inferior half-bred	..	..	..	..	9d. „ 10d.
Superior crossbred	..	..	..	..	10½d. „ 12d.
Medium to good crossbred	..	..	..	..	9d. „ 11d.
Inferior crossbred	..	..	..	..	7¾d. „ 9d.
Lincoln and Leicester	..	..	..	..	8¾d. „ 10½d.
Lambs, good	..	..	..	..	11d. „ 13d.
Lambs, medium	..	..	..	..	9d. „ 10¾d.

These values were taken as representing the average prices for New Zealand wools sold by auction in the Dominion in January, 1914, and 55 per cent. was added thereto for all wool purchased by the Government.

Slips and scoured wools, with the exception of slips wools derived from freezing companies' establishments, were valued on the greasy price basis. Freezing companies' slips wools were, by arrangement, despatched to London for valuation, an arrangement being made under which 75 per cent. of the estimated value was paid in New Zealand, the balance remaining to be paid after final valuation in London had been completed.

Low-grade wools which it was desirable to scour before shipment were distributed among various private scouring establishments in the Dominion, the owners of which were registered as Government wool-scourers. These carried out their work under conditions laid down by the Government, the scoured wool being afterwards valued by Government Valuers before going into store to await shipment. The work of these scourers was supervised by specially appointed Inspectors, who were selected on account of their expert knowledge.

SHEEP-SKINS.

In accordance with the desire of the Imperial Government, arrangements were made in February to requisition all sheep-skins on behalf of the Government (except those from sheep and lambs slaughtered at freezing-works) at the prices shown in the following schedule:—

	Merino Skins.	Half-bred Skins.	Fine Crossbred Skins.	Coarse Crossbred Skins.
Three-quarter to full-woolled skins	d.	d.	d.	d.
Sound	10½-11½	13-14	12-13	11½-12½
Faulty	9½-10½	11½-12½	10½-12	10½-11½
Damaged	8½-9½	10-11	9½-10½	9½-10½
Half-woolled skins				
Sound	8½-9½	11-12	10½-11½	10-11½
Faulty	8-9	10-11	8½-10	8½-10
Damaged	7½-8½	8½-9½	7-8½	7-8½
Short to quarter-woolled skins				
Sound	7½-8½	9½-10½	9½-10½	8½-10½
Faulty	5½-6½	7-8½	7-8½	7-8½
Damaged	5½-6½	6½-7½	6-7½	5½-7
Shorn				
Sound	5½-6½	8-9	8½-9½	8-10
Damaged, faulty	3-4	3-6	4-7	4-7

Lamb-skins: Sound, 11d.-12½d.; damaged, 8½d.-11½d.; seedy, 4½d.-9d.

HIDES.

Hides and calf-skins were requisitioned at the following prices:—

Ox-hides, first quality, over 45 lb. up to freezing companies' best standard	s. d. 1 1
Others, first quality	1 0
Ox-hides, second quality	0 11½
Cow-hides, first quality, up to freezing companies' best standards	1 0
Others, first quality	0 11
Cow-hides, second quality	0 10½
Bull-hides, good quality	0 9

All other grades and qualities, including cut and slipy hides, to be fixed at relative valuations.

Arrangements were made to supply the Governments of Australia and Canada with such hides as were required by them for strictly military purposes; and also for enabling tanners within New Zealand to obtain all the hides they required for their own business. The hide-purchasing scheme has worked well.

FIELDS DIVISION.

REPORT OF J. BROWN, B.Sc.Ag., N.D.A., DIVISIONAL DIRECTOR.

Central Development Farm, Weraroa, 1st June, 1917.

The Secretary of Agriculture, Industries, and Commerce.

HEREWITH is submitted my report of the work and progress of the Fields Division for the year ended 31st March, 1917. As desired, the report is presented in condensed form, and deals in outline only with the various activities coming under the administrative direction of the Division.

J. BROWN, Director, Fields Division.

ORGANIZATION AND STAFF.

Amalgamation of Positions of Fields Supervisors and Fields Instructors.

Early in the year a notable change was brought about in the organization for the supervision of inspection work and for field instruction work respectively. The offices of Fields Supervisor and Fields Inspector, previously distinct and responsible for separate defined duties, were amalgamated. The six officers previously holding positions as Fields Supervisors or Fields Instructors were appointed to the new conjoint positions, and, conforming to the new arrangement, they have during the year undertaken supervisory functions in rabbit and weed control, together with executive and supervising duties in connection with field-crop experiments and general advisory work amongst farmers. The designation "Fields Instructor" has been dropped, and that of "Fields Supervisor" has been retained. Two new Supervisors have also been appointed, so that there are now such officers having headquarters at Auckland, Napier, Wanganui, Christchurch, Timaru, Dunedin, and Invercargill.

It is pleasing to be able to report that the work of these officers during the past year has fully substantiated the views which led to this important change, district work of all kinds having received a more thorough attention than was possible under the old system of separation of closely related functions, and correspondingly larger districts.

Grain-grading.

The recent appointment of Mr. A. W. Smith to the new position of Chief Grain Grader marks a forward step in that branch of the Division's work, which it has been realized for some years has been on an unsatisfactory basis. Mr. Smith had just commenced to go fully into the business of grading with a view to the recommendation of an improved system when he was called upon to undertake temporary duties in connection with wheat prices on behalf of the Board of Trade. It is hoped, however, that he will shortly be available for the prosecution of the duties for which he was appointed.

Fields Inspection.

With regard to the work of the Fields Inspectors throughout New Zealand, the events and changes which have occurred during the year are not without certain disquieting indications. Some changes have been made in the various inspectorates during the year, and also some new appointments, while several inspectorates remain vacant at the close of the year. A few of these changes have been brought about by the promotion of the officers concerned to higher positions; other vacancies have occurred through resignations, two of these being returned soldiers; the remaining changes have been brought about through enlistments for military service. Such frequent changes as have occurred during the past year not only increase difficulties at headquarters, but also react most unfavourably on the districts themselves. Especially for rabbit-infested inspectorates it is no easy matter to procure the services, as Inspectors, of men who understand and are thoroughly experienced in rabbit-control, and who possess at the same time a satisfactory general education, address, and knowledge of field-work generally to give them prestige among the communities in which they are situated. Elsewhere in this report reference is made to a system of training of future field officers for which preparations have been made, the ultimate realization of the aims of which will elevate the field-work of the Division to an altogether higher plane. In the meantime the exigencies of fields inspection necessitate fresh appointments as vacancies occur. The salary and status of an Inspector are such as to attract only men with the bare qualifications for the discharge of the routine duties, and sometimes, as in the case of rabbit districts, not even that. The Division is thus at the present time facing the very real danger of its inspectorates becoming filled by permanent officers incapable of assisting with the development and conservation of the agriculture of New Zealand, except in the very narrow sense of routine administration of the Rabbit and Weeds Acts. This tendency has been specially manifested during the past year, and how it may be checked is under consideration. It is sufficient to say that it would be most unwise to continue the making of new appointments of Fields Inspectors at salaries which were formerly sufficient to attract good men but are now no more than labourer's hire. It cannot be too strongly emphasized that the duties and responsibilities imposed upon the Fields Division demand the highest type of officer in the field, and if from lack of understanding of the country's needs the narrow view of the field officers' position is adhered to it would appear to be the most ill-considered policy to continue to impose upon a professional directorate the control and regulation of a staff whose functions thus circumscribed would be purely administrative. It is, however, the earnest wish of the Division that so far from any such narrowing-down and debasement of the fields officers' position being allowed for want

of counter-effort to demark the future, a more liberal appreciation of the measure of a field officer's service and opportunity, both on his own part and on the part of the public, will rule.

Central Development Farm.

It is felt that more is required of this Division than the control of rabbits and weeds by field officers, and the direction of the latter and of sundry unsystematized and non-co-ordinated experimental projects, and the rendering of more or less casual advice on agricultural matters by a semi-administrative, semi-professional staff at headquarters. The discharge of these duties, important as they are, leaves something to be desired if the Division is to exert that influence upon the development of agriculture which should be its most valued prerogative. It must become less of a mechanical regulating agency and more of a vital energizing force, discarding as far as possible the routine of the office, and seeking inspiration and opportunity for its leaders and specialists, as well as for the rank and file of "field" workers, in constant intimate association with the affairs of the farm and the country. For officers whose aspirations are for rural welfare, and whose life-work is the study of farm problems, the city is no fit environment. Representation of this and other incidental advantages of a change of headquarters from city to farm, duly made and considered, have resulted in various alterations and arrangements at the Weraroa Experimental Farm to adapt it for the purpose in view. These arrangements were sufficiently advanced at the end of the year to enable the transfer of the divisional headquarters to be effected during the month of April, 1917. The farm is to be known henceforth as the "Central Development Farm."

The main object of this change is to bring together, under conditions favourable for the study of farm problems, certain professional officers of the Department, and to apply their efforts jointly and individually to important investigations arising out of the needs of New Zealand agriculture as a whole, and to such other activities as are likely to promote national welfare in the agricultural domain.

The professional staff, with the co-operation of the district officers and experimental farms, will devise, co-ordinate, and set in train experimental work on the farms and on special experimental areas, conduct farm-management investigations by cost-accounting methods at the experimental farms and by special farm surveys, carry out weed surveys with a view to rational weed-control, and generally promote inquiries as to the status of agriculture throughout New Zealand, with a view to more complete or more economic utilization of the country's various district resources and development of its potentialities. This will bring about in time a highly organized, efficient central bureau of agriculture, with associated district bureaux. It will be readily appreciated that the value of this work will depend largely upon the ability of the district officers, who will require to discharge the executive part of the programme, to act as "intelligence" officers for the central bureau, to communicate and demonstrate results of value to the farmers, and to co-operate with local organizations in all propaganda for rural betterment.

Student-assistants.

In order to ensure the future supply of field officers of the right kind arrangements have been made for a system of student-assistantships at the Central Development Farm. The training of about twenty young men, to some extent by definite instruction from the professional officers stationed there, and largely by association with them in the work of the station, and the experience thereby gained will, it is hoped, enable the district work in the course of a few years to be brought by degrees to a satisfactory standard.

EXPERIMENTAL FARMS.

Central Development Farm, Weraroa.

The past year has not been altogether favourable for the ordinary farming and dairying operations. The spring was specially wet, rendering the cropping and experimental operations unusually difficult and tedious. Phenomenally dry conditions set in early in November and continued up to the end of the financial year. The effect of this unusual condition on the returns from dairying has been most marked.

With regard to crops, potatoes were grown on a more extensive scale, and variety and manurial experiments were included. The dry conditions seriously affected the yield, which did not exceed 5 tons per acre average. Cereal, forage, and root crops were satisfactory, oats yielding about 2½ tons of excellent chaff, in addition to being fed off by sheep three times, and in one paddock four times. When on a September ploughing yielded up to 36 bushels. Peas, tares, and linseed also gave satisfactory and payable yields. There were over 150 acres in crops of various kinds. Experiments were conducted on the manuring of crops, top-dressing for hay-production, and on lucerne and pastures.

The breeding of Friesian cattle has been fairly successful this year, although conditions have been much against high production. Young Oak de Kol heifers in their first lactation went over 300 lb. butter-fat, the two best of such records being 380 lb. and 404 lb. Female stock having now increased greatly in numbers it is intended to cull heavily next spring. The Shorthorn herd is in a less satisfactory position. The heifers that came in this year were disappointing both in appearance and production. The herd will require to be culled down from twenty-seven to twelve or fourteen. It is hoped that the advent of a new, specially selected Darbalara bull will result in superior stock.

The need for increased accommodation for staff and student-assistants, and of provision for laboratory and office facilities to enable this station to discharge its future function as the Central Development Farm, has caused much activity and preparation during the year. The adjoining section of 30 acres with its commodious homestead has been acquired for the purpose of a hostel. Buildings have been adapted for seed-testing and biological work, for soil and fertility investigations, and for divisional offices. Houses are in course of erection for the Director and the Biologist. New piggeries and woolshed and yards are nearing completion.

Ruakura Farm of Instruction.

It may safely be stated that 1916-17 has been a most prosperous year for this station. With few exceptions, results have exceeded expectations, particularly in regard to pasture formation and crop production. One of the most important experiments is in relation to the employment of temporary fillers when laying down permanent pasture. A progress report has already been supplied on this experiment, and a further one will shortly be available. The grass-plot experiments initiated last season have furnished valuable information substantiating the results of the temporary-filler plots. A reduction in the weight of seeding of temporary fillers, judging from their influence over the permanent pasture, is recommended, and a further trial with a lighter seeding immediately suggests itself.

A variety of fertility experiments have also been in progress during the year, while a good deal of work has been done in connection with the testing of seed and plant introductions in the nursery. The growing of red clover for seed was continued on a larger scale. The success of last year's crop proved so encouraging that it was decided to close an extra field for seed. As a result three clover stacks have been harvested. There is not the least doubt that this district will grow excellent red-clover seed, and on account of its market price, which can be based at 1s. per pound, the crop will pay handsomely. Other seeds harvested this last season included *Lotus major*, Western woliths, rye-grass, cocksfoot, mangels, vetches, and horse-beans.

The success which has attended the cultivation of lucerne at this station should dispel all doubts as to its immense value. This year's results cannot fail to impress on farmers, and particularly dairy-farmers, the great returns which can be expected from lucerne. Every care has been exercised in recording full details regarding the lucerne-field from the 31st March, 1916, to the 31st March, 1917, and a special report has been made thereon.*

Considerable progress has been made with the drainage-work this year. Thorough drainage is one of the essentials at Ruakura if development is to be expected. The area still to be drained is about 178 acres, and this is work which should be undertaken as early as possible. The cleaning-out of open drains alone is no small contract, and is work which requires attention annually. Some of these drains, particularly those dangerous to stock, have been piped and filled in. During 1916 over 100 chains of these drains were piped and levelled. During the same time two large fields, Nos. 55 and 56, were thoroughly drained, and the latter brought under the plough. Every acre thus won from the swamp is a valuable addition to Ruakura, and it is these additional acres that increase the carrying-capacity of the farm.

The past season has been no doubt a record one for high prices for live-stock, with the exception of horses. A steady demand is maintained for the best pedigree stock from Ruakura, and all fat stock meets with a ready sale at high figures.

Progress is being made with the building-up of improved herds and flocks. Testing of dairy cows has continued, with the result that several have been culled on their performances. The introduction of the tested Jersey bull Golden Swan should do much to improve the present Jersey herd, as he is beyond doubt the best bull so far introduced. For some time past the very best Shorthorn bulls obtainable have been used on the Shorthorn herd, and their progeny give promise of developing into cows possessing better qualities than their dams. Their butter-fat records are not yet obtainable, but eight heifers by Darbalara bulls are due to calve in the ensuing season as three-year-olds.

Although the demand for Southdown stud sheep was not so great as in previous years there was no difficulty in disposing of all rams offered for sale at this station. Several orders could not be supplied. A new stud ram has been purchased, and it is hoped that he will leave good-quality lambs. The fat-lamb experiment conducted this season placed the Southdown before the Border Leicester for this purpose. A special report dealing with this experiment will be submitted later. The last of the lambs sold at 27s., whereas similar lambs on or near the same date last season only realized 15s. 6d. This, of course, is due to market rates, there being no appreciable difference in the quality of the lambs.

Improvements during the last year have been mainly in the direction of draining, fencing, bringing in of unimproved land, and small additions to existing buildings. No buildings of any consequence have been erected, although urgently required. The building of a new office, and the erection of improved poultry-houses, as recommended last year, have not yet been put in hand. The building of a proper shearing-shed, with suitable sheep-yards adjacent, is work which should be undertaken at an early date.

Ten farm learners are at present undergoing a course of training, and during the year ten have completed their course.

The Ruakura Farm has been under the present direction and management for something under two years. No marked deviation from the policy of the previous administration has occurred during that time. Under this regime varied and excellent services have undoubtedly been rendered to the farming community and the State. It has, however, become increasingly apparent that certain changes may require to be effected in the near future. Especially is it desirable that the scope of the farm, the residential accommodation available, and the opportunities for training should not be limited to ten learners. Too few learners and too many labourers is certainly a state of matters which calls for correction. The time has also arrived for a closer scrutiny of the affairs of the institution with a view to readjustment of expenditure on the various services according as they are of prime or of secondary importance as divisional enterprises. It may be necessary to make very considerable reductions in some directions, as Ruakura now accounts for an undue share of the expenditure on experimental farms.

Moumahaki Experimental Farm.

The year has been a strenuous one for the management; shortage of skilled workmen has made it difficult to effectively carry on general farming operations, consequently experimental work has been considerably curtailed. During the year all employees eligible for military work joined the Forces, thus considerably reducing the efficiency of the staff.

* Published in the Department's Journal for June, 1917.

Climatic conditions during the year have been somewhat peculiar, and although the total precipitation has been normal the summer is probably the driest that has been recorded in this district.

Hay and grain crops were harvested in good condition, the former being quite up to the average of previous years. Hot winds during the month of December caused considerable loss in the oat crop, consequently the yield has been somewhat low. Dry weather militated against root crops, swedes being very poor, while there are numerous vacant spaces in the mangel crop; yet on the whole the roots are good. Carrots are a very fine crop. Potatoes, although sound, are very small, and will not yield sufficiently to be profitable.

The value of lucerne has been forcibly demonstrated during the drought, and while grass has been burnt by hot winds and sun lucerne has produced a succession of luxuriant crops. All classes of live-stock have been grazed on the lucerne-fields and have kept in splendid condition. During the year the area under this fodder has been increased, about 12 acres being sown for experimental work, from which interesting data should be available next season.

In the horticultural branch the lack of assistance has also been keenly felt, and work has consequently been chiefly of a routine nature. Nevertheless varieties of vegetable-seeds have been tested, concomitant with keeping up a supply of vegetables for farm use.

In plant-breeding work, considerable time has been devoted to the selection of Italian rye-grass, red clover, white clover, cocksfoot, Scotch vetch, potatoes, and numerous other plants. Encouraging results have been obtained in several instances, but some time must elapse before definite results are obtainable.

During the spring a number of young steers and older bullocks were selected for the purpose of comparing the advantages (if any) of fattening cattle at the age of two years instead of growing them on to three and a half and four years of age. The older cattle will shortly be ready for the butcher, but as some time must elapse before the steers are fat the result will not be determined in the meantime.

A considerable number of cattle have been fattened in the ordinary course during the year, and disposed of at remunerative prices. Shorthorn cattle on the farm are of good type, and as the cows are rearing some good calves the future of the herd is assured.

The dairy herd consists entirely of Ayrshires, of which twenty-one cows are this season at the pail. From its inception the breeding and management of this herd has received every attention, and it is gratifying that to-day it is second to none in the Dominion. During the spring the imported bull Auchenbrain Exchange was added to the herd; his progeny will be looked forward to with interest. Another valuable addition to the herd is the imported cow Wylie-land Kate Lockhart 2nd, and Ayrshire champion, now in calf to the imported bull Netherton Good Bonus.

The flock of Ryeland sheep is progressing, and comprises a number of animals which would be creditable to the breed in any English show-ring. This breed is not yet sufficiently known in the Dominion to receive the attention it merits.

The Moumahaki Berkshire pigs are so well known that comment is unnecessary, representatives from the herd being now distributed throughout the Dominion. Great attention has been paid to the breeding of the herd, a special feature, always carefully watched, being fecundity. The herd is still being handled under very disadvantageous conditions with regard to housing.

Six farm learners completed one year's training, and their places have been filled by other boys.

Ashburton Experimental Farm.

The delay in appointing an Overseer to this farm until late in the season greatly hindered progress being made to get this farm into tilth. This, together with the weedy condition of much of the land, necessitated a great deal of work being done in a short space of time. However, the work was tackled in an energetic manner by Mr. J. G. McKay, who was appointed Overseer, and good progress has been made. On account of the very dry season experienced from the beginning of spring until within a week of the close of the year, the crops grown have been light. The foundation of good work, however, has been laid for future experiments and demonstrations in crops, &c., and useful data collected in regard to crops grown under the abnormally dry conditions prevailing. Following is a list of experiments and demonstrations undertaken to the close of the year: Varieties of potatoes; manuring of potatoes; size of seed test. Peas and tares variety test. Rotation lime experiments, in two series. Pastures: Rotation demonstration; green-manuring and feeding-off experiments; phosphate availability. Variety trials in wheat, oats, barley, forages, and roots. Special selection work with wheat; wheat-breeding.

Mr. Allan, Agricultural Instructor at the Ashburton High School, has been in regular attendance at the farm for observation and recording purposes. His services have been greatly appreciated.

The work of the farm has been under the general supervision of Fields Supervisor Macpherson, who has attended to all details in his usual thorough manner.

MISCELLANEOUS EXPERIMENTAL UNDERTAKINGS.

During the year provision was made for the establishment of a limited number of small experimental areas on selected type soils, the work on these being carried out by farmers or local agricultural committees in co-operation with the Department. This arrangement is intended to replace the co-operative experimental plot system hitherto in vogue. The benefits which accrued from the latter system were pointed out in my last annual report. These farmers' trials were conducted, however, under great disadvantages. Being scattered over the country, they did not command and focus the attention of the farmers, and were not under regular observation by the field officers. They were very often imperfectly carried out, and demonstrations continuing on for several years were not possible. Their substitution by definite experimental areas on which

various experiments or demonstrations may be conducted, if necessary over a term of years, with compensation to the person or persons providing the land and doing the cultivation, &c., is now aimed at.

So far only one such area has been definitely arranged—namely, in Fields Supervisor McCulloch's district, at Gore, its extent being 30 acres. Arrangements are in progress for areas at Thames, Waihi, and Whakatane under Supervisor Rowan's superintendence. Other Fields Supervisors have this matter in hand, and further developments may be expected during the ensuing year.

A considerable number of plot experiments have still been carried out during the past year, pending the establishment of the areas above referred to on the new basis.

In order to get some definite data on the grassing of the soils of the granite formation of north-west Nelson, 13 acres of bush land in the Murchison district have been taken in hand for experimental grassing, the sowing of the plots being completed in March, 1917. The rotation scheme at the Marton plots and the demonstration work on the gum land at Albany have been continued. Similar work to that undertaken at Albany has been initiated at Purewa, near Whangarei.

No further work has been done on the gum land at Akerama and Kaitaia.

With regard to the immense tract of pumice land extending over the central volcanic plateau of the North Island, and the experimental work on the Taupo, Kaingaroa, and Lichfield plots, matters have remained practically in abeyance since last year. A special report on the possibilities of pumice-land development was submitted in March this year.

Experiments on the forest lands and pakihis of the West Coast of the South Island, and the regrassing trials at Earnscleugh, Central Otago, have been followed up and further observations made.

OTHER SERVICES.

The usual advisory work has been continued, its volume being somewhat reduced, no doubt for reasons arising out of the war. Much work has been done in connection with the development of limestone-deposits. Some attention has been given, by request, to the farms attached to institutions of the Education Department, and proposals submitted for their management. Educational displays were made at the Invercargill, Dunedin, Ashburton, Timaru, Palmerston North, Hawera, and Tapanui winter shows, at the Christchurch, Nelson, Kirwee, and Little River summer shows, and at the Oxford and Kaikoura autumn shows. Special war work in connection with soldiers' settlements, wheat-growing, &c., has required a good deal of attention.

FERTILIZERS.

The number of vendors who have registered brands is 355. During the year nineteen samples were taken for analysis.

RABBIT NUISANCE AND NOXIOUS WEEDS.

The administration of the statutes to control rabbits and noxious weeds comes under the operations of this Division. To successfully administer these demands discretion and energy on the part of the Fields Inspectors entrusted with the work. The assistance and co-operation of the farmers in particular should be extended to these officers, who have often to carry out rather disagreeable duties. Friction is unavoidable, but it is only when forced by necessity that Inspectors resort to prosecution. In every case, however, great discretion is used, and where proceedings are instituted those prosecuted are well warned beforehand of their failure to comply with the conditions of the Acts.

Rabbit Nuisance.

The rabbit nuisance generally is under control in most parts of the Dominion. It is certainly so in all districts where trapping for sale or export does not exist. In those parts where trapping has become a recognized industry control is not so noticeable, and the pest has this season assumed a rather serious aspect. It is certain that many landowners consider trapping and sale of rabbits as a satisfactory means of dealing with them, and the past season has been very favourable for the increase of the pest. This, added to the great outcry of scarcity of labour owing to the war, has tended, especially in Otago and Southland, to let rabbits get out of hand. The excuse that labour was unprocurable has kept the staff very busy endeavouring to get some work done, and officers generally have taken this into consideration and not unduly harassed settlers. Agitation in some quarters was rife that Inspectors were making demands which could not be complied with on account of shortage of labour, but it was found that this appeared to be in many cases only an excuse, as when trapping started more men were available than were blocks to operate on. Much was said about suspending the Act for the duration of the war and putting Inspectors on to "productive work," but it is certain these officers are employed at very useful work in their present occupation if the true interests of the Dominion are to be considered. It should be apparent to all right-thinking farmers and others that if a high state of production is to be maintained the rabbit nuisance must be firmly controlled, because so long as the country continues to export large quantities of frozen or canned rabbits and skins, just so long will the vastly more important export of wool, frozen mutton and meat, and dairy-produce suffer.

It is pleasing to be able to report that the sales of phosphorized pollard from most of the Department's depots has this year greatly increased, showing that the article is appreciated by and has come into favour with farmers, and that they are now recognizing it is the cheapest and most effectual way of dealing with the pest.

Noxious Weeds.

The control of weeds is probably one of the most difficult problems that can be set out for satisfactory administration. Most weeds now coming under the Act had firmly established themselves almost throughout the whole of the Dominion before legislation was provided, so that an

immediate or great improvement over any extent of country can scarcely be expected. I think the generally expressed desire of the country is in favour of effective suppression, but the question is how this is to be satisfactorily carried out. Agricultural and pastoral associations and many County Councils and local bodies are mostly in favour of the continuance and administration of the Act. This would appear to be an intimation that the Department should adopt more vigorous measures than it has perhaps hitherto. Lately the Board of Agriculture distributed a large number of circulars to farmers and also to the Fields Inspectors, asking for information as to the weeds considered the worst, and their opinion regarding means of control. A good deal of valuable information has been received in this way, and when properly compiled this should become exceedingly useful as a guide.

The general condition as regards weeds is that in very many localities useful work has been effected, and on agricultural lands this is clearly shown. Improvement is not so generally noticeable on grazing or pastoral districts. Where the lands are timbered owners can scarcely be expected to effect much till these lands are cleared of timber. The efforts of the Inspectors to repress weeds are showing useful results. The same difficulty—shortage of labour—applies here, and more acutely than in the suppression of the rabbit pest. It has to be borne in mind that it would be impossible to effect immediate clearance over any large areas except at great cost and hardship, and this is a point the officers take into consideration, and where it is found that reasonable work is being done under the Act owners are not harassed.

There are still a number of so-called “weed-destroyers” advertised, but none prove really effective. Some are fairly so, but the cost is prohibitive; others are dangerous to live-stock; the effect of some is that the land is unfit for other plants for a long period. Experience has shown that the application of any of these is not the most effective way of dealing with weeds. Cutting or grubbing of some plants, judicious stocking and grazing methods on pastoral properties, and intelligent cultivation and cropping systems on arable lands, prove the best means of control.

A large amount of work has been done on occupied lands this season, settlers realizing it pays better to have the ground in crop or grass than in weeds. Inspectors and others are still faced with the question of dealing with the trouble on Crown and Native lands, reserves, absentee sections, &c. The only hope of dealing effectively with this is to get the lands occupied and cultivated. Certainly sums of money are spent on these lands, but they are quite inadequate to cope with the trouble. Still the action of spending what is appropriated has had a most encouraging effect on settlers who may have properties adjoining these unoccupied lands.

NEW ZEALAND HEMP INDUSTRY.

The following report is furnished by the Chief Hemp Grader (Mr. W. H. Ferris) on his branch of the Division:—

The year just ended has been one of continued activity and prosperity for the hemp industry, both in production and export, the demand for our fibre having been extremely keen throughout. The output graded exceeded last year's figures by 11,623 bales, and the prices ruling were a record for the Dominion.

The ports of Auckland and Bluff showed an increase of 7,140 and 8,667 bales respectively, and the ports of Foxton and Picton a decrease of 2,358 and 740 bales respectively. The increase at Auckland and Bluff was due principally to the reopening of a large number of small mills (which had been closed down for years) owing to the highly remunerative prices ruling. The decrease at Foxton was due to floods and to certain of the larger mills having to close down some of their strippers owing to shortage of labour. During the winter months millers as a rule close down in order to attend to their swamps and to avoid the risk of exposing the flax-bulbs to the effects of the frost; but this year was an exception, and practically every mill throughout the Dominion, where possible, worked during the whole of the season.

The drought in the Manawatu district was responsible for the destruction by fire of about 800 acres of millable leaf. Loss by fire does not end with the destruction of the existing crop; the plants are so weakened that they take a considerable time recovering, and very often are destroyed outright.

Quality of Hemp.—I regret to again have to state that during the year there has been a further increase in the proportion of lower grades of fibre produced. One of the principal causes of the production of lower grades was the very small difference in prices offering between good-fair (which should be our standard grade) and fair. At one period during the year London quotations showed only a difference of 10s. per ton between these grades, and although the difference is now £1 per ton it is still far less than warranted by actual quality. At the prices ruling millers are content to aim at no higher grades than high-fair and low-fair, as a greater output can be obtained by them and at a less cost of production. The weather conditions on the whole were fairly good for milling, the chief exception being the Auckland District, where the continual wet weather interfered greatly in the production of a good grade of fibre. The green leaf throughout the Dominion, especially in the Manawatu district, was in a decidedly better condition than the previous year, the fibre showing no signs of the blight or flax-grub. This can be attributed to the very heavy floods which occurred just at the time when the grub began to attack the green leaf. Most of the “rejected” hemp which come into the grading-stores during the season had been damaged by flood-water. The percentages of good-fair graded at the various ports are—Auckland, 4 per cent.; Napier, 60 per cent.; Wellington, 15 per cent.; Foxton, 24 per cent.; Picton and Blenheim, 76 per cent.; Bluff, 10 per cent.

Quality of Tow.—The quality of tow still leaves room for improvement, the chief and usual defects being lack of cleanliness, or freedom from dust and rubbish, and it is to be regretted that millers will not take more care with this by-product. As will be seen from the attached tables, the first and second grades of tow show a decrease of 4 per cent. in each case as compared with the previous year, while the percentages of third grade and condemned are correspondingly higher. Auckland and Bluff show up worst in quality of tow graded. Although the output of hemp shows an increase of 11,623 bales, that of tow shows a decrease of 1,360 bales. The decrease is accounted for by the larger proportion of low-grade fibre produced, for which the hemp is scutched to a lesser extent than for higher grades.

Stripper-slips.—The quality of stripper-slips continues to improve, the percentage of first grade showing an increase of 8 per cent. on the previous year. Owing, however, to the poor demand, combined with the low prices offering and high freights, millers did not take the trouble to prepare this by-product in any quantity for the market.

Shipping-space.—During the year the matter of shipping-space presented a very serious difficulty, especially as regards shipments to the United Kingdom. At one period the port stores were so congested that a large number of millers throughout the Dominion had to practically cease work for three or four weeks. Fortunately, however, shipping prospects improved, and fairly large quantities of hemp were also shipped to America and Australia, although at the present time fair quantities are still awaiting shipment.

Prices.—The following were the price-movements for hemp, f.o.b., during the year: April–June, good-fair £34 per ton, high and low fair £33 and £32 per ton respectively; July–September, good-fair £36, other grades £1 less in each case; October–December, good-fair £39, high-fair £38 10s., low-fair £37; January–February, good-fair steadily increased from £39 to £48 per ton, with other grades £1 less in each case. During March good-fair was quoted at £52 10s., high-fair £51 10s., and low-fair £50. The price of tow ranged from £9 to £17 per ton for first grade, with second grade £1 per ton less, fluctuating with the increases in freight and shortage of space in oversea steamers.

Grading Statistics.

The following tables give particulars of the gradings during the year ended 31st March, 1917, the Dominion totals and percentages for the previous year being also included for purposes of comparison :—

Hemp (Bales).

Grading-ports.	Superior.	Fine.	Good-fair.	Fair.		Common.	Rejected.	Condemned.	Total.
				High-fair.	Low-fair.				
Auckland	..	..	1,365	9,233	13,295	4,643	787	33	29,356
Foxton	..	..	10,570	18,623	11,757	1,274	432	16	42,672
Wellington	3	86	7,733	32,663	9,940	1,164	161	11	51,761
Napier	..	..	715	452	8	..	..	..	1,175
Picton	..	232	530	67	11	..	..	..	840
Blenheim	..	154	2,059	674	146	48	6	..	3,087
Lyttelton	..	14	15	53	..	..	..	..	82
Bluff	..	37	1,627	8,856	5,046	356	26	..	15,948
Dunedin	..	..	636	3,136	1,093	112	..	..	4,977
Totals for year ended 31st March, 1917	3	523	25,250	73,757	41,296	7,597	1,412	60	149,898
Percentage	0.02	0.35	16.84	49.2	27.55	5.06	0.94	0.04	..
Year ended 31st March, 1916	..	1,407	35,065	67,295	28,596	4,598	1,077	237	138,275
Percentage	..	1.01	25.36	48.67	20.69	3.33	0.8	0.17	..

Tow (Bales).

Grading-ports.	1st Grade.	2nd Grade.	3rd Grade.	Condemned.	Total.
Auckland	51	2,797	5,690	1,289	9,827
Foxton	2,861	3,942	948	45	7,796
Wellington	2,154	5,423	1,943	147	9,667
Napier	38	86	8	..	132
Blenheim	617	886	12	6	1,521
Picton	154	157	..	1	312
Lyttelton	176	456	..	..	632
Bluff	14	1,587	4,018	423	6,042
Dunedin	31	916	574	79	1,600
Totals for year ended 31st March, 1917	6,096	16,250	13,193	1,990	37,529
Percentage	16.2	43.3	35.2	5.3	..
Year ended 31st March, 1916	7,807	18,476	11,305	1,301	38,889
Percentage	20.06	47.3	29.5	3.3	..

Stripper-ships (Bales).

	1st Grade.	2nd Grade.	Condemned.	Total.
Year ended 31st March, 1917	986	3,724	145	4,855
Percentage	20.2	76.8	3	..
Year ended 31st March, 1916	719	4,910	246	5,875
Percentage	12.2	83.7	4.1	..

HORTICULTURE DIVISION.

REPORT OF T. W. KIRK, DIVISIONAL DIRECTOR.

Wellington, 5th June, 1917.

The Secretary of Agriculture, Industries, and Commerce.

I HAVE pleasure in submitting herewith the annual report of this Division for the year ended 31st March, 1917.

T. W. KIRK, Director, Horticulture Division.

INTRODUCTION.

The work coming within the scope of this Division has been energetically carried out during the past year. The following are the principal activities dealt with:—

- (1.) Instruction in fruit and vegetable production; inspection of orchards, vineyards, gardens, and nurseries, and affording information as to the most up-to-date methods of controlling diseases and insect pests; also giving advice as to suitable varieties of fruit, vegetables, &c., to plant.
- (2.) Demonstrations and instruction in the grading and packing of fruit, and in pruning and spraying.
- (3.) Testing new brands of spraying-compounds for the purpose of ascertaining their efficacy under local conditions.
- (4.) Affording advice on the preserving of fruit and vegetables both for commercial and domestic purposes.
- (5.) Advising on tree-planting; giving information as to the most suitable varieties of trees to plant, both for shelter and timber purposes, in different localities.
- (6.) Control of the horticultural stations at Te Kauwhata, Tauranga, and Arataki.
- (7.) Registration of all orchards and nurseries in the Dominion.
- (8.) Orchard-tax: Assessment, &c.
- (9.) Inspection of all imported fruit, plants, vegetables, bulbs, &c., at the ports of Auckland, Wellington, Christchurch, Dunedin, and Bluff; also inspection and grading of all locally grown fruit, plants, vegetables, &c., intended for export.
- (10.) Viticulture and winemaking: Giving advice on the growing of grapes, both outdoor and under glass, on the control of pests and diseases, and on the making of wines.
- (11.) Affording information on beekeeping generally and the production of honey for market.
- (12.) Inspection of apiaries and instruction in up-to-date methods of controlling bee diseases.
- (13.) Grading of honey for export; registration of honey export brands.

THE FRUITGROWING INDUSTRY.

The planting of new orchards is proceeding at a very satisfactory rate, and the total area now under fruit for the whole of the Dominion is approximately 48,120 acres. The area actually planted in commercial orchards in the various districts during the year under review is estimated at 2,390 acres. This is a decrease of about 1,000 acres as compared with the previous year's planting, but this is no doubt largely due to the disorganization of labour, &c., caused by the Great War. The following figures show the area planted during the 1916 planting season in each Instructor's district: Whangarei, 100 acres; North Auckland, 200; South Auckland, 50; Poverty Bay, 20; Waikato and Bay of Plenty, 25; Hawke's Bay, 75; Taranaki, 5; Manawatu and Wairarapa, 60; Nelson, 1,325; Marlborough, 100; North Canterbury, 100; South Canterbury, 30; Otago, 300: total, 2,390 acres.

The weather-conditions prevailing during the fruiting season were very trying to fruit-growers generally, more particularly in the Auckland and Hawke's Bay districts. Incessant rains interfered to a large extent with the setting of fruit, and fungoid diseases were rife and difficult to control. As a result the crop was a light one in all districts with the exception of Otago, where good average crops of both pip and stone fruits were harvested.

Brown-rot, a fungus disease which was prevalent last year, caused very serious damage to stone-fruit, particularly in the Auckland District, where the crop was practically a failure. Arrangements are being made to conduct a series of experiments during the coming season for the control of this disease, which is causing considerable loss both to the growers and retailers.

The continuous wet weather also played havoc with the tomato crop in the northern districts, the adverse conditions greatly interfering with spraying operations.

The requests for advice and information on the many phases of the fruitgrowing industry still continue to increase, and it is evident from the numerous calls received for private instruction and public demonstrations that the work of the Division is being fully appreciated.

During the year the following additional work was undertaken by this branch of the Department: Registration of nurseries; registration of orchards (from one tree upwards); assessment, &c., orchard-tax. This involved a large amount of detail work both for clerical and field staffs.

The shortage of staff caused by officers enlisting for active service is, however, seriously interfering with the proper carrying-out of departmental work, it being a very difficult matter to secure suitable men to replace those on leave. Nevertheless every endeavour is being made to cope with the extraordinary conditions prevailing, and extra hours are being worked by the majority of the staff.

Fruit-markets.

The inspection of auction markets and fruit-shops has been carried out as regularly as possible under the existing circumstances, and the Inspectors report that the bulk of the fruit arriving on the markets is clean and well graded. In a number of instances immature fruit has come under their notice, being sent in, no doubt, with the view of catching the high prices prevailing. This is, of course, a great mistake, and only tends to considerably lower the price of really good fruit. Prices realized during the season for good-quality fruit have been very satisfactory to the growers. The light crops secured in a number of the fruitgrowing areas no doubt had a tendency to keep prices up.

Export of Fruit.

Owing to the disorganization caused in shipping by the war, and changes of steamer routes, very little fruit was exported during the year. A total of 19,246 cases was shipped to South America at the beginning of the season, the bulk of the fruit coming from the Nelson District. The Inspectors report that the fruit was of good quality, well graded, and the packages attractively got up. Only in a few instances was loose packing noticed.

The following figures show the quantities of fruit exported from the Dominion during the export season of each of the last five years, the bulk of it being apples: 1912, 14,869 cases; 1913, 33,000 cases; 1914, 67,964 cases; 1915, 62,164 cases; 1916, 19,246 cases. It is expected that when shipping arrangements again become normal these figures will be greatly exceeded, and that the export of fruit will eventually develop into one of the leading industries of the Dominion.

Pruning and Spraying Demonstrations.

The increasing requests for practical instruction in the pruning and spraying of fruit-trees take up a good deal of the Orchard Instructors' time. Following the usual custom adopted in former years, demonstrations on these subjects have been carried out by the Orchard Instructors in their respective districts during the winter months. That the demonstrations are greatly appreciated is evidenced from the large and enthusiastic attendances of fruitgrowers and others who are anxious to adopt the most up-to-date methods of orchard-management. This practical advice afforded is of immense benefit to the fruitgrowing industry generally.

Certificates in Pruning and Spraying.

Examinations of persons desirous of obtaining the Department's certificate in pruning and spraying are conducted each year in the various centres. Since these classes were established four years ago some forty persons have qualified in the subjects mentioned.

Apple Grading and Packing Classes.

Classes in apple grading and packing have now been firmly established in the leading fruitgrowing districts, and are well attended. This is a very important feature in the building-up of an export trade, and the value of these classes cannot be overestimated. Already quite a number of persons have gained the Department's certificate in fruit grading and packing.

Cool Stores, Fruit-packing Sheds, &c.

The erection of suitable cool stores and central fruit-packing sheds in the chief fruitgrowing centres is now receiving considerable attention. Under the Fruit-preserving Industry Act advances are made by the Government for the establishment of *bona fide* cool stores for fruit, fruit-packing sheds, fruit-canning works, and other works in connection with the packing, grading, or preservation of fruit. This assistance is being taken advantage of to a large extent, and several stores and packing-sheds have been built and others are in course of erection in different localities. These establishments will provide a long-felt want, particularly in those districts where large quantities of fruit are now being handled.

Co-operative Fruit-testing Plots.

The establishment of co-operative fruit-testing plots was commenced in 1911. Since that date some sixty-four of these areas have been planted in different localities throughout the Dominion. They are proving an excellent means of demonstrating what varieties of fruit are best suited for certain districts, and also up-to-date methods of pruning, spraying, and cultivation. The results obtained from some of the earlier-planted plots are now coming to hand, and will be published through the medium of the Department's *Journal*. This information should be very valuable to fruitgrowers generally, who have evinced a keen interest in the work carried out on these test areas.

Testing New Spraying-compounds.

Any new spraying-compounds coming under the notice of officers of the Division are carefully tested for the purpose of ascertaining their reliability for the control of orchard pests and diseases. Previously these tests were carried out by the Orchard Instructors, but as their time was fully taken up with other work the operations are now conducted at the horticultural stations under the control of this Division. Several specifics have been tested at these stations during the year, and the results obtained will be published in due course.

Orchard Pests and Diseases.

As mentioned in the earlier part of this report, fungus disease caused considerable damage in a number of districts where the wet-weather conditions during the fruiting season prevented anything like systematic spraying being carried out. Stone-fruits suffered severely from attacks of brown-rot, which was very prevalent in the Auckland and Hawke's Bay districts, and experiments are being undertaken for its control.

In some localities the leaf-roller caterpillar was very conspicuous, considerable quantities of fruit, chiefly apples, being badly blemished by this insect and rendered unfit for market. Growers will require to take extra precautions for the control of this pest by carefully spraying with arsenate of lead.

The Orchard Instructors report a continued improvement in the control of diseases in orchards generally. In a number of instances, however, some difficulty is now being experienced in securing suitable labour for carrying out such work as pruning and spraying. No doubt this will become more acute as the war goes on.

Root-knot in Imported Fruit-trees.

During the season a considerable amount of trouble was experienced by the officers of the Department and others concerned in connection with the importation of Australian fruit-trees. Despite the definite warning previously issued by the Department with respect to root-knot a large proportion of the season's imports was on examination found to be affected with the disease. Early in the year several consignments were condemned and reshipped, whilst others were destroyed. Later on condemnations were held over by the shippers pending an investigation. It was eventually decided, with a view of minimizing the loss to New Zealand planters, to allow the condemned consignments to be picked over and the non-affected trees to be passed.

National Patriotic Apple Show.

This show was held in the Town Hall, Wellington, from the 8th to 13th May inclusive. A very excellent collection of fruit and fruit products from all parts of the Dominion was tastefully displayed in the various courts. As a result of the judging the Nelson exhibit was placed first, Hawke's Bay second, and Canterbury third. The main object of the exhibition was to popularize the New-Zealand-grown apple and to bring under the notice of the public the importance to which the fruit industry has already reached, and its present and prospective value to the Dominion. The profits of the show were devoted to the patriotic funds in connection with the war.

Registration of Nurseries.

Regulations for the registration of all nurseries in the Dominion were gazetted in June, 1916. These require all occupiers of nurseries which come within the meaning of the regulations to apply for registration not later than the 1st day of April in each year. As a result 376 nurseries were registered during the year, representing the sum of £376 in fees. The inspection and registration of these nurseries has entailed a large amount of extra work both on the field and clerical staff of the Division. I am pleased to report that these regulations have been welcomed by the nurserymen as a whole, and in the majority of cases they are giving every assistance to facilitate the work generally.

Orchard Registration and Orchard-tax.

The work of registering all orchards from one tree upwards was undertaken during the year. It is estimated that one hundred thousand applications to register have been received, and the recording of this large number, together with the compiling of lists of occupiers in each Orchard Inspector's district, has been no small task. These lists will prove of great value in facilitating the orchard-inspection work.

Under the Orchard-tax Act which was passed last session all occupiers of orchards from which fruit is sold or intended to be sold are required to pay a tax each year calculated at the rate of 1s. per acre or part of an acre, with a minimum charge of 2s. 6d. Moneys received are paid over to the New Zealand Fruitgrowers' Federation (Limited), to be expended in the furtherance of the interests of the fruitgrowers of New Zealand. Some ten thousand tax-demand notices have been sent out from this office, and according to the figures supplied by the Postal Department, through which the tax is collected, the sum of £1,917 had been received up to the 31st March, 1917. The Act has been well received throughout the Dominion, orchardists recognizing that it is in the interests of the fruitgrowing industry generally.

HORTICULTURAL STATIONS.

The work at the horticultural stations at Te Kauwhata, Tauranga, and Arataki has been carried out under the careful supervision of the respective Managers. Several improvements and extensions have been dealt with during the year.

Te Kauwhata.

Shortage of suitable labour (over twenty permanent and temporary employees having joined the Forces), together with an exceptionally wet spring and summer, militated greatly against the efficient working of the station.

The fruit crop was a very light one, peaches being, with few exceptions, a complete failure. Owing to the wet and humid conditions fungoid diseases were very prevalent, especially on pears. On the other hand, the grape crop was a record one. Tests with different spraying-compounds

have been carried out for the control of black-spot on pears, particulars of which it is intended to publish in the *Journal*.

The preparation and planting-out of four new orchard blocks was commenced, but the work has been greatly delayed by inclement weather. This is being pushed on as the conditions improve. A power tractor has been procured for the station, and is proving a great success in working this heavy class of land.

Trials carried out with some early varieties of potatoes were not a success, owing chiefly to the excessive wet rotting the seed.

Owing to a break in the machinery and not being able to procure duplicates no wattle-bark was stripped last spring. Repairs have now been effected, and if labour is available the usual quantity can be stripped next season.

The grape crop has been the best recorded at the station, a good spell of fine weather allowing the fruit to set, with the result that there was an excellent vintage. The new concrete fermenting-vats have been a complete success for the quick handling of the grapes. Apart from the extra capacity afforded the wine seemed to ferment quicker, the temperature being more even than in the wooden vats. There has been an excellent demand for the wines made at the station, the quantity sold being greatly in excess of previous years' business.

Tauranga.

Considerable improvements and extensions have been carried out at this station during the year. The year was the wettest on record in Tauranga, 74.68 in. of rain falling. This, of course, interfered to a large extent with the work, the extraordinary weed-growth requiring constant attention.

An area has been prepared for the raising of nursery stock; the land has been ploughed, limed, and sown down in white lupin, which will be turned under next spring; other cover-crops will be grown during the summer, so that the land will be in good heart for planting next autumn.

A number of varieties of apples which had proved unsuitable for the district were reworked with better commercial sorts. Seedlings of lemons, oranges, and limes were raised for stocks on which to work lemons, which do exceedingly well in the Tauranga district.

Considerable attention has been given to the cultivation of the sweet potato or kumara, twenty varieties being under test. A report cannot be made until the tubers are lifted. Some of the sorts imported from the United States are very promising, and sets should be available for distribution next planting season. Tests have also been continued with different varieties of maize, but as the season was such an unfavourable one there were indications that the cobs would not be well filled.

The lucerne has again proved to be a valuable crop, four cuttings having been made. The plot requires careful attention in keeping it clear of weed-growth in the spring, especially if the season is a wet one. A grass-garden has been commenced, containing sixty-three plots of grasses and clovers, all plots being clearly labelled. This should provide valuable information to interested persons in the district.

Some five thousand plants of *Pinus radiata* have been planted on the rough slopes, and a further quantity will be put in during the coming winter.

The apiary at the station is now well established, thirty colonies of bees having been worked up.

During the season demonstrations in pruning, grafting, and budding were given by the Manager to the teachers and scholars of the local high school.

Arataki.

The usual work of ploughing, cultivating, pruning, spraying, &c., has been carried out. Some reorganization in the apple-orchard was taken in hand during the year. The purpose in view was to convert the trees to four of each variety instead of two. This involved heading down and reworking a large number of trees. The number of varieties grown was thus materially reduced by eliminating those that had been proved unsuitable to the locality. An additional 3 acres has been planted with apple-trees for demonstration purposes.

During the winter months demonstrations of ploughing, pruning, and power spraying were held. Each demonstration was of a competitive nature, and excited a large amount of interest.

On account of the unfavourable season experienced the fruit crop, with the exception of peaches, was a very light one. Grapes, however, were a good crop throughout. Mildew gave some trouble owing to wet and changeable weather, but was subdued with very little loss of fruit.

A series of spraying tests on a large and comprehensive scale were conducted during the year in co-operation with the Hawke's Bay Fruitgrowers' Association, the members of which lent every assistance and showed great interest in the operations. Reports on these trials have been published in the *Journal*.

Hops.

According to figures supplied by the Customs Department, 4,449 cwt. of hops, valued at £17,708, were exported during the year. The following figures show the quantity and value of hops exported from the Dominion during the last five years ending 31st March: 1913, 2,340 cwt., value £20,698; 1914, 5,152 cwt., value £26,430; 1915, 3,216 cwt., value £20,786; 1916, 4,425 cwt., value £17,742; 1917, 4,449 cwt., value £17,708.

IMPORTED FRUIT.

The following figures, obtained from the Customs Department, show the quantity of fresh fruit and fruit products imported into the Dominion during the year. The previous year's figures are quoted for comparison.

	1916-17.		1915-16.	
	Quantity.	Value.	Quantity.	Value.
		£		£
Fruit, fresh, dutiable	3,761,462 lb.	36,699	3,115,103 lb.	33,334
„ „ free	24,015,296 lb.	148,396	19,504,349 lb.	120,066
„ bottled and preserved ..	188,161 doz.	47,482	178,297 doz.	39,301
„ dried	10,710,667 lb.	225,806	13,227,036 lb.	200,102
Lemon and orange peel in brine ..	587,627 lb.	3,690	857,657 lb.	5,638
Fruit-pulp and partially preserved fruit	63,545 lb.	1,096	55,565 lb.	950
Totals	..	463,169	..	399,391

INSPECTION OF IMPORTED FRUIT, PLANTS, AND VEGETABLES.

The Fruit Inspectors stationed at the five ports of inspection—viz., Auckland, Wellington, Christchurch, Dunedin, and Bluff—report that the bulk of the fruit, plants, &c., imported during the year arrived in good order and condition. There were, of course, several lines which opened up in an unsatisfactory state, the fruit being very second-grade stuff. Several consignments of Tasmanian apples were of poor quality. Apples from America and Canada arrived in excellent condition.

There has been a big increase in the quantity of tomatoes received from Rarotonga. The fruit was of good quality and opened up in satisfactory order. Several lines of bananas from Fiji were of very poor quality, being small in size and apparently only half-grown. It was found necessary to condemn and destroy a number of consignments of oranges on account of their being infected with fruit-fly maggot. Fruit and plants infected with live scale, mealy bug, &c., had to be fumigated before being allowed to land.

The following is a summary of all fruits, plants, &c., imported at the ports of entry in the Dominion during the year, the previous year's figures being also given for comparison:—

Port of Entry.	Fruit.				Plants, Vegetables, &c.			Grand Total of Packages.
	Total.	Destroyed.	Fumigated.	Reshipped.	Total.	Destroyed.	Fumigated.	
1916-17.	Cases.	Cases.	Cases.	Cases.	Packages.	Packages.	Packages.	
Auckland ..	395,637	128	4,700	109	31,789	168	27	427,426
Wellington ..	157,189	1,701	260	246	50,380	582	..	207,569
Christchurch ..	64,782	282	258	..	2,047	19	3	66,829
Dunedin ..	51,561	1,097	27	2	9,087	29	6	60,648
Bluff ..	9,857	100	70	..	1	..	..	9,858
1915-16								
Auckland ..	311,483	840	5,735	170	14,071	6	..	325,554
Wellington ..	137,522	662	2,252	474	21,026	9	..	162,548
Christchurch ..	69,806	851	673	575	1,824	10	..	71,630
Dunedin ..	55,932	515	628	249	5,085	28	1	61,017
Bluff ..	7,346	6	57	40	1,735	..	..	9,081

VITICULTURE AND WINEMAKING.

There has been no increase during the year in the area under vineyards, which stands at 454 acres. The number of vinehouses throughout the Dominion is estimated at 850, being a slight increase on last year's figures. Owing to the unfavourable weather experienced in a number of districts the crop of outdoor-grown grapes was lighter than that of the previous year. This resulted in a smaller quantity of wine being produced. Nevertheless, approximately, 85,000 gallons were manufactured, which at a conservative estimate of 2s. 6d. per gallon represents a value of £10,625. There is an increasing demand for New-Zealand-made wines.

THE BEEKEEPING INDUSTRY.

I am pleased to report that the beekeeping industry is still progressing at a very satisfactory rate. The number of persons taking up this means of a livelihood has considerably increased, and

apiaries that were small last year have developed to such an extent that they now come under the heading of commercial apiaries.

The honey crop in the majority of the districts was again a light one, particularly in Canterbury, where the climatic conditions were adverse to a good honey-flow. In the Southland District, however, beekeepers were favoured with another successful season, the returns even exceeding those of last year.

A further decrease in box hives is noticeable. Farmers are beginning to realize more and more that box hives are not profitable, and in many districts they have been entirely eliminated. More efficient steps are now being taken by beekeepers to keep foul-brood under control. This is no doubt largely due to the fact that the advice given by the officers of the Division, both by letter and practical demonstration, is being taken advantage of to a great extent.

Several demonstrations and lectures on beekeeping matters have been given by the Instructors in their respective districts, and were largely attended on each occasion. These demonstrations bring the officers in close contact with beekeepers in different localities, and produce conditions which ensure mutual good feeling; they also afford opportunities of teaching practical methods of manipulation.

The local honorary apiary inspectors appointed to assist the Instructors are doing very good work, and at small expense to the Department. Their assistance is of great value to the beekeeping industry generally in the better control of diseases, &c.

Export of Honey.

According to the Customs figures, 1,572 cwt. of honey, valued at £3,554, was exported during the year. This is a decrease of 818 cwt. as compared with the previous year's figures, brought about by the poor season experienced, lack of shipping, and also by the high prices prevailing locally.

All the honey is graded by the Department's Graders before shipment. There is a marked improvement in the manner in which the honey is now being got up for export, producers realizing that it is unwise to submit consignments unless the quality and packing are good. Owing to the price of tinplate having increased considerably, due to shortage of supplies, there is a tendency on the part of a few producers to forward honey in second-hand tins. This is very undesirable, as unsuitable packages greatly depreciate the price of the contents.

The following are the quantities of honey graded by each Instructor during the year: Auckland, 522 cwt.; Wellington, 640 cwt.; Christchurch, 72 cwt.; Dunedin, 192 cwt.

Ruakura Apiary.

As mentioned in my last report, the supervision of the apiary at the Ruakura Farm of Instruction has been handed over to this Division. During the year experiments have been conducted with several different makes of hives to ascertain their advantages and disadvantages, and daily temperatures have been taken, &c. One innovation that is worthy of special mention is the placing of each hive on a sheet of asbestos slate. This adds greatly to the appearance of the apiary, and facilitates the cutting of the grass round the hives, besides being a saving in labour. Other experiments are to be undertaken next season. The apiary is under the charge of Mr. A. B. Trythall, who has a wide knowledge of beekeeping in New Zealand, and who takes a keen interest in experimental work. During the season a number of cadets gained the Department's certificate in beekeeping.

PUBLICATIONS.

The increasing demand for literature on the many phases of fruitgrowing, &c., has necessitated the writing of special articles for the *Journal*, and also the preparation and revision of bulletins, which work is of considerable magnitude.

STAFF.

The work of the Division has been interfered with to a large extent by enlistments of officers for active service from both the field and clerical staff. A large number of the temporary employees at the horticultural stations have also gone to the front.

In February last Mr. W. H. Taylor, Manager of Arataki Horticultural Station, was promoted to the position of Horticulturist to the Department, with headquarters at Wellington. This was a very necessary appointment, and Mr. Taylor's long experience of horticultural matters should prove of great help in carrying out the work of the Division. I have much pleasure in reporting that all officers have, under the adverse circumstances, carried out their duties in a satisfactory manner.

DAIRY DIVISION.

REPORT OF D. CUDDIE, DIVISIONAL DIRECTOR.

Wellington, 22nd May, 1917.

The Secretary of Agriculture, Industries, and Commerce.

I FORWARD herewith the annual report of this Division for the year ended 31st March, 1917. In doing so I wish to acknowledge the assistance rendered by Mr. W. M. Singleton, Assistant Director, in connection with the work of the Division.

D. CUDDIE, Director, Dairy Division.

THE SEASON.

Generally speaking, it can be said that the past dairy season has been a profitable one for those engaged in the production of butter and cheese. The weather-conditions have been favourable in the provincial districts of Auckland, Hawke's Bay, and Southland; but in Taranaki, Wellington, Canterbury, and North Otago several months passed with little or no rainfall. This hindered the growth of grass to a very considerable extent. Consequently, the supply of milk showed an earlier decrease than usual. Many farmers were thus forced to begin feeding their cows on crops specially grown for use later in the year. Fortunately, however, a much larger number of the settlers now make provision for a contingency of this kind, and are therefore able to keep their cows milking longer than would otherwise be the case when grass becomes scarce owing to a partial drought.

LABOUR DIFFICULTIES IN REGARD TO DAIRYING.

Owing to the continuation of the war farmers have experienced great difficulty in obtaining any extra help required during the busier part of the year. Offers of higher wages in many instances were of little avail, and much of the farm-work has had to be postponed for the time being, the owners having to confine their efforts to attending to the dairy herds. Moreover, the position has become so acute that a number of the farmers have already decided to milk fewer cows next year.

In a less degree the same trouble has arisen in connection with the engagement of dairy-factory employees, more especially in the case of skilled men. Quite a number of first and second assistants, as well as a number of factory-managers, have joined the Expeditionary Forces, and it has been extremely difficult to fill these vacancies; in fact, dairy companies have been compelled to engage many hands who have not had the necessary experience in this class of work.

EXPORTS.

Although the production of butter has been well maintained, the quantities exported for the year show a decrease as compared with the previous year's figures. Owing to the scarcity of shipping-space large quantities of butter throughout New Zealand were awaiting shipment, and consequently the quantities in cool stores on the 31st March far exceeded the total on the same date last year. As showing the extent of the accumulation of this product it may be stated that the number of boxes in store at the end of the year under review totalled 239,936, as against 87,678 boxes on the same date last year. On the other hand, cheese exports show a slight increase, the quantity exported amounting to 849,478 cwt., or 4,035 cwt. in excess of last year's total. This apparent disparity between the butter and cheese shipments may be explained by the fact that all the cheese was purchased by the Imperial Government from October, 1916, and preference of shipments given to this produce for the needs of the Army. Then, again, a fairly large accumulation of the previous year's production was in store on 1st April, 1916, and unusually heavy shipments took place from then onward to July—a period in which little or no shipments of butter take place. The major portion of the butter and cheese exported was shipped to the United Kingdom, and vessels representing fifty voyages engaged in carrying this produce to the Home markets.

The following tables show the quantities and classes of dairy-produce exported from the various grading-ports:—

EXPORTS FOR YEAR ENDED 31ST MARCH, 1917.

Creamery Butter for United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	381,862	372,775	9,063	24
Gisborne	8,405	8,405	..	..
New Plymouth	106,470	105,907	563	..
Wanganui	12,891	12,082	809	..
Patea	4,482	3,336	1,146	..
Wellington	119,419	116,072	3,347	..
Lyttelton	25,777	25,618	159	..
Dunedin	15,503	15,218	285	..
Totals	674,809	659,413	15,372	24

Whey Butter for United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	3,450	1,107	2,343	..
New Plymouth	3,087	1,946	1,139	2
Wanganui	329	193	136	..
Patea	10,426	8,109	2,308	9
Wellington	6,959	3,520	3,386	53
Lyttelton	213	108	105	..
Dunedin	1,332	1,009	323	..
Totals	25,796	15,992	9,740	64

Dairy Butter for United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
New Plymouth	480	334	138	8
Totals	480	334	138	8

Milled Butter for United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	386	104	274	8
New Plymouth	138	112	26	..
Wanganui	609	590	19	..
Wellington	5,763	4,645	1,118	..
Lyttelton	470	470	..	..
Dunedin	939	880	59	..
Totals	8,305	6,801	1,496	8

Butter for Australia, South Africa, and South Sea Islands.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	15,268	15,067	201	..
New Plymouth	2,641	2,641	..	..
Wellington	8,639	7,839	800	..
Lyttelton	234	234	..	..
Dunedin	1,400	1,400	..	..
Totals	28,182	27,181	1,001	..

Butter for Vancouver and West Coast Ports of United States.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	2,489	2,489	..	..
Wellington	..	..	..	..
Totals	2,489	2,489	..	..

Total Quantity of Butter exported from all Grading-ports.

Port.	Creamery.	Whey.	Dairy.	Milled.	Totals.
	Packages.	Packages.	Packages.	Packages.	Packages.
Auckland	399,603	3,450	..	402	403,455
Gisborne	8,405	..	..	..	8,405
New Plymouth	109,111	3,087	480	138	112,816
Wanganui	12,891	329	..	609	13,829
Patea	4,482	10,426	..	..	14,908
Wellington	128,058	6,959	..	5,763	140,780
Lyttelton and Timaru	26,011	213	..	470	26,694
Dunedin	16,903	1,332	..	939	19,174
Totals	705,464	25,796	480	8,321	740,061

Cheese for United Kingdom.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	68,270	65,492	2,723	55
New Plymouth	99,443	91,191	8,217	35
Wanganui	11,695	9,812	1,883	..
Patea	142,920	128,723	14,131	66
Wellington	142,758	133,707	9,024	27
Lyttelton and Timaru { Factory	15,337	14,486	851	..
Dairy	147	64	83	..
Dunedin	20,737	19,917	820	..
Bluff	92,317	87,198	5,025	94
Totals	593,624	550,590	42,757	277

Cheese for Australia, South Africa, South Sea Islands, &c.

Port.	Total Packages.	First Grade.	Second Grade.	Third Grade.
Auckland	135	123	12	..
New Plymouth	20	20	..	..
Wellington	289	289	..	..
Lyttelton and Timaru	83	83	..	..
Dunedin	239	239	..	..
Bluff	245	245	..	..
Totals	1,011	999	12	..

Total Quantity of Cheese exported from all Grading-ports.

Port.	Packages.
Auckland	68,405
New Plymouth	99,463
Wanganui	11,695
Patea	142,920
Wellington	143,047
Lyttelton and Timaru	15,567
Dunedin	20,976
Bluff	92,562
Total	594,635

Total Weights of Butter and Cheese exported.

Countries exported to.	Butter.	Cheese.
	Cwt.	Cwt.
United Kingdom	354,659	848,034
Other countries	15,335	1,444
Totals	370,030	849,478

Quantities of Butter exported from all Ports for the Years ended March, 1916, and March, 1917.

Port.	1915-16.	1916-17.	Increase, 1916-17.	Decrease, 1916-17.	Net Total De- crease, 1916-17.
	Packages.	Packages.	Packages.	Packages.	Packages.
Auckland	470,691	403,455	..	67,236	..
Gisborne	7,143	8,405	1,262	..	..
New Plymouth	132,944	112,816	..	20,128	..
Wanganui	8,769	13,829	5,060	..	..
Patea	11,572	14,908	3,336	..	..
Wellington	144,309	140,780	..	3,529	..
Lyttelton and Timaru ..	9,856	26,694	16,838	..	..
Dunedin	7,554	19,174	11,620	..	..
Totals	792,838	740,061	38,116	90,893	52,777

Quantities of Cheese exported from All Ports for the Years ended March, 1916, and March, 1917.

Port.	1915-16.	1916-17.	Increase.	Decrease.	Net Total In- crease, 1916-17.
	Packages.	Packages.	Packages.	Packages.	Packages.
Auckland	55,361	68,405	13,044	..	..
Gisborne	525	..	..	525	..
New Plymouth	107,527	99,463	..	8,064	..
Wanganui	10,379	11,695	1,316	..	..
Patea	173,413	142,920	..	30,493	..
Wellington	133,120	143,047	9,927	..	..
Lyttelton and Timaru ..	9,725	15,567	5,842	..	..
Dunedin	26,475	20,976	..	5,499	..
Bluff	75,285	92,562	17,277	..	..
Totals	591,810	594,635	47,406	44,581	2,825

GRADING OF BUTTER AND CHEESE.

Table showing the Grading-points scored by the Butter and Cheese graded throughout New Zealand for the Year ended 31st March, 1917.

Grading-points.	Butter.		Cheese.	
	Number of Boxes.	Percentage.	Number of Cases.	Percentage.
72	15	0-0015	..	..
76	..	..	78	0-0011.
77	48	0-0048	54	0-0008
78½	52	0-0053	228	0-0334
81	110	0-0112	206	0-0305
81½	37	0-0037	55	0-0008
82	143	0-0145	288	0-0426
82½	176	0-0178	91	0-0134
83	342	0-0347	472	0-0699
83½	379	0-0381	497	0-0733
84	1,279	0-1297	1,398	0-2071
84½	1,392	0-1411	1,521	0-2269
85	2,923	0-2963	5,952	0-8820
85½	4,398	0-4459	8,198	1-2150
86	6,960	0-7057	17,041	2-5010
86½	2,849	0-2886	10,192	1-5104
88	11,531	1-1692	27,395	4-0599
88½	11,543	1-5747	29,494	4-3696
89	36,118	3-6621	51,647	7-6543
89½	38,194	3-8725	82,630	12-2459
90	66,528	6-7455	106,281	15-7510
90½	69,800	7-0773	101,156	14-9915
91	89,746	9-0999	88,491	13-1160
91½	110,630	11-2173	60,161	8-9161
92	130,273	13-2090	42,650	6-3208
92½	110,794	11-0234	22,210	3-2915
93	73,972	7-4958	10,283	1-3574
93½	142,011	14-3992	3,548	0-5106
94	46,341	4-6987	2,403	0-3561
94½	13,913	1-4107	55	0-0081
95	7,636	0-7742	80	0-0103
95½	1,980	0-3007	..	..
96	180	0-0181	..	..

CREAMERY BUTTER.

The system of separating milk on the farms has shown a further extension during the year, and there are now few butter-factories in New Zealand which are not receiving supplies of home-separated cream. As the delivery of this cream is accepted every second day by the majority of the dairy companies—and in some cases delivery extends to a longer period—the quality of the butter made therefrom does not come up to the higher standard of butter made at a factory where whole-milk is received daily. At the same time there has been some improvement during the year in the butter made from cream which has been separated on the farms. Some of this improvement is no doubt due to the method of grading cream which has been adopted by a number of the dairy companies, and more especially where a lower price is paid for the cream which does not come up to the highest grade. This has the effect of inducing the dairy-farmer to take great care in the handling of his cream, and an extension of the system of grading is required in order that the improvement in the quality of the butter made may continue.

In the case of those dairy companies that have adhered to the method of skimming the milk at their own factories or skimming-stations what may be termed a fancy butter has been made during the year, and this product has been, and will continue to be, in greater demand than that made under the system of home separation. It would be well, however, for the producers of butter in New Zealand to seriously consider the question of improving their cream-supplies by a stricter method of supervision on the farms—greater cleanliness in regard to the utensils used and the cooling of the cream, together with a more frequent delivery to the factory.

WHEY BUTTER.

The skimming of whey for the recovery of the butter-fat contained in this liquid has now become general among the cheese-factories. Therefore the quantity of whey butter made shows an increase on the figures of last year. Altogether, 25,796 boxes of whey butter came forward for grading, as compared with 16,825 boxes in the preceding year.

With the exception of the produce from a few of the factories the quality of the whey butter has been of low grade, and much of it very inferior. This inferiority is due mainly to the lack of care and interest taken on the part of those who are responsible for the manufacture. It is difficult to understand why directors of dairy companies do not insist upon their employees devoting closer attention to this branch of the work, because a well-made whey butter is of higher value and more readily disposed of than that which is poorly made or defective in flavour. At those factories where the managers take a keen interest in turning out a good article the quality of the whey butter leaves little or nothing to be desired; in fact, some of it is equal to that of the creamery standard.

The regulation providing for the proper branding of whey butter has been closely observed during the season, and in no case has the Division found it necessary to take proceedings against dairy companies for any irregularity in this connection.

MOISTURE IN BUTTER.

In order to guard against the sale and export of butter containing a percentage of moisture above the legal standard of 16 per cent., samples were taken from a large number of the consignments arriving at the various grading-stores. A preliminary test of these samples was then made by the Graders, and in all butter where an excess of moisture was detected additional samples were sent under seal by registered post or delivered by hand to the Department's Chemist for analysis. Almost invariably the preliminary test by the Grader was confirmed. The manufacturer of such butter was given the opportunity of receiving a sample for an independent analysis if desired. The penalty for the offence was prosecution followed by a fine, or the butter was treated to reduce the water content, under the supervision of the Grader at the owner's expense. As a result of this action on the part of the Government buttermakers are now extremely careful in regulating the amount of moisture in butter. Consequently prosecutions for this offence are seldom found necessary. The average moisture-content of all the samples taken during the year was 14.62 per cent.

QUALITY OF CHEESE.

Owing to the partial dislocation of the dairy industry on account of the war, dairy companies, factory-proprietors, and factory-managers have had to contend with many disadvantages in carrying on the manufacture of cheese during the year. Amongst those disadvantages may be mentioned a large quantity of faulty milk to handle, the employment of a larger number of inexperienced men in the factories than usual, a shortage in the supply of rennet, accumulation of cheese stocks in the factories, and a shortage of timber for the making of cheese-crates.

Under these circumstances it was feared that the quality of the cheese generally would at least be below the usual standard; but, fortunately for the industry, this fear has not been realized. Strange to say, exactly the opposite has occurred. In the reports received from the Dairy-produce Graders mention is made of a considerable improvement in the season's cheese as compared with that of last year.

The Instructors of the Division also report that cheese of better quality has been produced in the different districts this year, and these opinions are confirmed after an examination of a considerable quantity of the cheese by the Assistant Director of the Division and the writer. There is therefore conclusive proof that special efforts have been made by many of the cheese-makers to overcome the disadvantages referred to above, and that these efforts have been in a measure successful. The greater part of the average improvement has been due to the system of pasteurization; but as regards individual factory outputs it has to be admitted that much cheese of indifferent quality has been made. In many such cases the flavour of the cheese was

seriously at fault, being unsound and not infrequently decidedly objectionable. The cheese which was found to be defective in flavour when comparatively new became, as a rule, much worse with the advance of maturity. This was more especially the case with cheese which was also defective in body and texture. Irregularities of the latter type were by no means uncommon, and they require to be rectified before the produce can give satisfaction to the merchants and consumers. Moreover, both the cheese of good quality and that which was found to be more or less inferior suffered heavy deterioration at those shipping-ports where no proper cool storage was available—but this phase of the season's operations is dealt with elsewhere in this report.

IMPERIAL GOVERNMENT CHEESE-SUPPLIES.

By an Order in Council dated the 16th January, 1917, the whole of the output of cheese available for export from New Zealand was in effect requisitioned on behalf of the Imperial Government. The price fixed was 9½d. per pound, f.o.b. ocean steamer, for first grade, with a reduction of ¼d. per pound for any second grade. Provision was also made for the payment of an advance up to 90 per cent. of the value of cheese which had been in store awaiting shipment over one month. On the recommendation of this Division advance payments were subsequently made on any cheese six weeks after manufacture, irrespective of the time it had been held in a grading-store.

The usual trade custom of accepting grader's weights, less an allowance of 2½ per cent. for shrinkage, was observed. This, however, did not work out quite fairly all round, as those dairy companies which were able to send their cheese forward promptly gained an advantage over others who were compelled to hold the cheese in their own stores owing to the congestion which took place at some of the grading-ports. In the latter case the cheese were of greater age and had already lost considerable weight through shrinkage; consequently a deduction of 2½ per cent. on that basis proved a disadvantage as compared with those dairy companies that were more fortunate in despatching their cheese without any delay. Any adjustment in this connection is extremely difficult, and it is doubtful whether it can be arranged.

Special conditions were laid down with respect to the packing of the cheese, in that heavier centre-boards with double nailing of battens to same, and the use of scale boards, was required for all consignments packed after the cheese was purchased. Immediately these consignments began to come forward a distinct improvement was noticed in the condition of the packages. The crates were strengthened in this way, and stacked to better advantage in the stores; and, what is more important, they maintained the cheese in better condition. It is therefore hoped that all dairy companies will continue to pack their cheese in this manner for the future, whether it be sold to the Imperial Government or placed upon the open market in the usual way.

The purchase of the cheese by the Imperial Government has entailed a considerable amount of extra work for the Dairy Division, more especially for the Dairy-produce Graders, who were made responsible for the grading and the checking of weights and specifications of each consignment. But the work has been carried through up till now with little or no friction, and where any mistakes have occurred these have been rectified without any serious difficulty. From the commencement of the purchase of the cheese this office has kept in close touch with the Department of Imperial Government Supplies, and has endeavoured to lend whatever assistance was required in that connection.

STORAGE OF CHEESE.

Owing to the shortage of cargo-space for cheese on the steamers loading for the United Kingdom large quantities of this produce has accumulated at the various shipping-ports. The stores have been greatly congested almost from the beginning of the season, and have not yet reached normal conditions. Never before in the history of the New Zealand cheese industry has the need for the cool storage of all cheese been so strongly emphasized as during the past summer months.

It is safe to say that anything from £25,000 to £30,000 has been lost to the dairy-farmers of the Dominion through the excessive shrinkage of cheese alone, to say nothing of a loss in quality caused by overheating. These losses have occurred mainly in the cheese produced in the provinces of Taranaki and Wellington. Large quantities of the cheese have been damaged owing to being held in buildings the temperature of which could not be properly controlled. The dairy companies making cheese in the Auckland Province, however, have been in the fortunate position of being able to cool-store the whole of their cheese, the Auckland Farmers' Freezing Company having provided suitable accommodation for the entire season's output. Therefore all cheese shipped from Auckland has been sent away in good order, and excessive losses in shrinkage have been avoided.

A portion of the cheese coming forward for grading at New Plymouth has been partially cool-stored, but neither the temperature of the various chambers nor the circulation of air has been properly regulated. Consequently the cheese stored at this point has been more or less detrimentally affected. These irregularities have been brought under the notice of the storage company concerned, and it is hoped that by the opening of next season better provision will have been made for the storing of cheese. In addition to the cheese held at the freezing-works many thousands of crates had to be stored in other buildings in order to relieve the pressure for room at the factories. The cheese in these stores suffered badly during the warmest weather, and caused much anxiety to those responsible for its supervision.

At Patea also the cheese-stores were greatly overtaxed, and the receiving of cheese had to be discontinued on several occasions during the season. Although the West Coast Refrigerating Company had provided some extra accommodation it was found insufficient to deal with all the cheese offering. Here again the temperatures of the different chambers could not be controlled as desired, but everything possible was done to make the best of the facilities available. Altera-

tions to the building and additions to the plant have now brought these works up to date, and in future cases will be held under approved conditions and at the desired temperatures. Owing to the shortage of space at Patea some cheese had to be graded at a central building at Hawera. This to some extent helped to relieve the pressure.

At the Port of Wellington none of the cheese could be cool-stored, as the new building erected for this purpose was not fitted with the necessary refrigerating plant in time for the warm weather. An extension was made to the cheese-store during the year, the necessary machinery has since been installed, and it is expected that the temperature of this building will be regulated so as to keep the cheese in good condition next year. Accumulation of stocks at Wellington was so great that another building had to be utilized for this purpose, and although the officials of the Harbour Board did their best to keep the cheese from spoiling by making provision for a good air-circulation by the installation of fans, &c., deterioration of the produce took place to a considerable extent.

Many of the consignments at Wellington and other ports became affected with cheese-mites, and the losses made on this account have also been considerable. The bulk of the cheese loaded in the North Island, with the exception of that from Auckland, was placed on board the steamers in a more or less heated condition. This gave rise to some comment on the part of the ships' officers, and finally resulted in all bills of lading for cheese being specially marked to indicate that the cheese was unsatisfactory when delivered to the ship. On the other hand, the shipments of cheese made from the South Island ports were found to be in much better order, as it was found possible to store the cheese at lower temperatures, and the produce presented a much better appearance at the time of shipment than much of the cheese from the North Island.

The harmful treatment which much of the cheese receives prior to leaving New Zealand has been brought under the notice of the producers from time to time, but they do not appear to take as much interest in this phase of their business as its importance demands. The position is one calling for immediate attention, for there is no guarantee that the accumulation of cheese at the main ports will be any less next year. If cargo-space is shorter than it has been large quantities of cheese may deteriorate to such an extent during the summer months as to become a total loss and unfit for shipment. Hence the urgent necessity for extending the cool-storage accommodation for cheese at the ports mentioned above.

PASTEURIZATION OF MILK FOR CHEESEMAKING.

A further extension of the system of pasteurization as applied to milk for cheesemaking has taken place during the year. In all, seventy-six factories are now fitted with regenerative pasteurizers and the necessary coolers for treating the milk. In the Auckland Province no less than twenty-seven cheese-factories out of a total number of fifty-four are fitted with these machines, twenty-six of which have been installed within the last twelve months.

This principle of cheesemaking has in many instances effected a remarkable improvement in the quality of the product, cheese made by this process being much better in flavour, and also in body and texture, compared with the cheese made at the same factories from raw milk during former seasons. The cheese is not only superior in flavour when made, but its keeping quality has also greatly improved. This process bids fair to become very popular, and already many additional pasteurizing plants have been ordered. If these come forward without undue delay they will be in operation at the beginning of next season.

In almost every case where the pasteurizing of milk for this purpose has been commenced the Instructors of the Division have been present to give the cheesemakers the advantage of their experience, and thus the change from the old order of things has been made on a fairly uniform basis.

It would appear that the time is not far distant when the bulk of the cheese produced, in the North Island at any rate, will be made from milk which has been treated by pasteurization. Fortunately this principle does not incur a heavy extra cost, and the benefits derived therefrom increase the market value of the cheese. A beginning has also been made with this system in the South Island, and here again it is likely to expand.

SUPPLY OF RENNET.

When the season opened it was feared, on account of a threatened shortage of rennet, that the production of cheese might be seriously interfered with. Fortunately this did not happen. It was ascertained later on that the majority of the dairy companies had taken the precaution to obtain stocks of rennet in advance of their requirements. Subsequently shipments of later orders, about the arrival of which there was some doubt, came to hand, much to the relief of those companies which had no surplus supply. Further relief was afforded when it became known that a substitute in the form of pepsin could be used.

Early in the season the question of utilizing pepsin was considered, and information having been received from the Dairy and Cool Storage Commissioner of Canada as to the success which attended trials of pepsin in that country, the Division was able to take the matter up without delay. A series of trials were then made at the Kaponga Dairy Factory, which proved conclusively that pepsin of the right quality was suitable for supplementing the supply of rennet, or for replacing the latter if found necessary. Pepsin in quantities being available about this time, many of the dairy companies decided to procure a sufficient amount of it for early use. The Instructors in cheesemaking have since visited many of the factories in order to introduce the use of pepsin, and, taken altogether, the result has been quite satisfactory.

The newly formed New Zealand Co-operative Rennet Company was fairly successful in collecting calves' vells during the early months of the season, and some twenty-five thousand of them were shipped to England to be made into rennet for return to New Zealand. The first lots of rennet from this source have since arrived in the Dominion. It is to be hoped that further

and larger supplies of vells will be collected during the beginning of next season, for it would be unwise to allow this valuable material to be wasted, notwithstanding the fact that pepsin is at present much cheaper than rennet.

CASEIN.

It has been estimated that prior to the war about 10,000 tons of casein were used annually in Europe, the bulk of this supply being produced in France, Scandinavia, and Argentina. The production having fallen off after the outbreak of war, and that from Argentina finding a market in the United States, it was to be expected that more inquiries would be received in New Zealand to make up this shortage. That expectation has been realized, and the price has risen in sympathy with the increased demand.

So far this industry has been confined to the North Island, where nine raw-casein factories and one drying-station have been in operation during the year. Other factories have been running for a portion of that time. Altogether 3,932 bags of casein, weighing 280 tons, have been exported during the year, and, in addition, some fourteen boxes of food casein. The export of this product for the preceding year amounted to 118 tons.

At the present time only one drying-factory (where the green curd is treated and prepared for the market) is available, which means that those factories situated a considerable distance away are put to some inconvenience in forwarding the raw material to the drying-station. The question of providing more facilities for drying the casein has been under consideration, and it is expected that some provision will be made for this extension in the near future.

The officer of the Division (Mr. Pedersen) who has a special knowledge of the preparation of casein has devoted a good deal of his time to assisting those who have commenced this work without any previous experience, and the help thus given has resulted in the production of a more uniform article. Some experiments in connection with the saving of casein from buttermilk have also been undertaken, and this work will be taken up again later on. The whole of the casein exported has been officially graded and the packages marked to denote the quality of the contents.

If the present market values of casein be maintained an extension of the business can be looked for during the coming season.

DAIRY INSTRUCTION.

For many years the instruction at cheese and butter factories as carried on by the officers appointed for this purpose has formed a special branch of activity in the Dairy Division. The recognized value of this work has never been appreciated to a greater extent than during the past year, as indicated by the number of applications received for the help of the Instructors from those engaged in the industry. A reduction in the number of Instructors, as the result of illness and of other causes, has, however, curtailed the good work to some extent. Moreover, this has meant some delay in attending to urgent calls for assistance which would otherwise have been avoided.

The number of officers who devoted the greater part, if not all, of their time to this duty was seven, and in addition four others spent whatever time they could spare in this important work. The total aggregate number of days on which these officers gave instruction in cheese and butter making and other features of the work incidental thereto amounted to 902. Apart from the instruction afforded on such occasions these officers paid a total of 661 visits to factories in the course of the year. The main object of these calls was to give advice to the makers of cheese or butter where required, and also to inspect the factory premises and plant and utensils in daily use.

Frequently meetings of dairy-company directors were attended to discuss matters of importance relating to the industry, and thus much useful knowledge was imparted to those concerned. On other occasions the Instructors gave addresses on dairy subjects to farmers by special arrangement. They invariably received a good hearing from the settlers, many of whom took the opportunity of asking questions in order to gain further information.

INSPECTION OF DAIRIES AND DAIRY UTENSILS.

While the inspection of dairies from which the supplies of milk or cream are delivered to factories is under the control of the Dairy Division, it has only been possible to undertake this work to a very limited extent. The reasons for this limitation have been already so fully explained in previous reports that there is no need to again refer to them here. It is sufficient to add that as far as time would permit the Instructors have visited those farms which were sending inferior milk or cream to be made into cheese or butter. Altogether 788 farms were visited on this account during the season, when the cause or causes of deterioration in the raw material were, as a rule, easily located. The main source of the trouble in this connection was unclean milking-machines; in fact, quite a number of these installations were found to be in a filthy, not to say disgusting, condition. In extreme cases the owners were called upon to cleanse the various parts immediately, or, as an alternative, to discontinue their use forthwith; but it is to be regretted that in some cases a later inspection disclosed an equally unsatisfactory state of affairs.

As the number of mechanical milkers has increased enormously owing to the scarcity of hand milkers since the war began, it will be seen that the risk of contaminating a larger quantity of milk has also been increased. This is confirmed by the Instructors' reports from every dairying district in the Dominion. Furthermore, the past year's experience has proved the absolute necessity of some drastic remedy to prevent the use of milking-machines which are allowed to become foul and insanitary through the neglect or ignorance of the owners. Unless some such step is taken in the near future the dairy industry of New Zealand will undoubtedly be placed at a serious disadvantage in competition with that of other countries on the open markets where our produce is sold.

TESTING OF MILK AND CREAM SAMPLES FOR BUTTER-FAT.

The Instructors of the Division have tested many samples of milk and cream at the factories in the course of their rounds. In addition to this, special visits to factories have been made for the purpose of supervising and reporting to the directors upon the accuracy of the testing as carried out by the factory-manager or other employees of the dairy company, as in past years assistance of this nature has been helpful in creating more confidence in the correctness of testing amongst the milk or cream suppliers.

Many of the dairy-farmers again took advantage of the facilities provided by the Division for the testing of samples of milk and cream at Wellington. As a general rule the samples came to hand in good order. Some of the senders, however, neglected to fill the bottles quite full; consequently the contents churned in transit, and could not be dealt with, which led to disappointment.

CERTIFICATE-OF-RECORD TESTING OF PUREBRED DAIRY COWS.

The testing of purebred cows has experienced a good year despite influences calculated to curtail this work. A few breeders who had been testing found it necessary to defer further work along this line, but their places have been very largely filled by the enrolment of names of new breeders. There are at present on test 330 cows owned by ninety-nine different breeders.

In the period under review two records of outstanding merit have been recorded. Mere, a yearling Jersey, owned and tested by F. S. McRae, of Palmerston North, produced in 365 days 663·64 lb. of butter-fat, which constituted a world's record for heifers of all breeds of that age. This record has attracted a good deal of attention in New Zealand and abroad.

Salma Johanna Lyons has won the leadership of the senior four-year-old Friesian class with a production of 21,439·8 lb. of milk containing 730·19 lb. of butter-fat. Her milk-yield constitutes a record for New Zealand, and displaces that of Manola, one of the Department's Friesians at Weraroa.

A larger proportion of the cows tested have been heifers on their first lactation period. These are not required to produce as much butter-fat as older cows in qualifying for certificates, and the greater proportion of young stock tested tends to reduce the average yield for all cows tested. The fact that these young cows usually get good treatment and a long lactation during their first milking period must be a potent factor in their development as superior dairy cows.

During the past year 145 cows have qualified for certificates, and seventeen repeat certificates have been issued for records of second or later tests. There are now 630 C.O.R. cows, and as this number increases each year purchasers of purebred butter-fat-record bulls are afforded better possibilities of selection.

COW-TESTING ASSOCIATIONS.

Abnormal conditions in the rural districts have so affected available labour that there is a tendency to delete from the dairyman's work all duties which can reasonably be avoided. This inclination has been evidenced in some of the cow-testing associations, where the membership has shown a falling off.

The maintenance of the numerical strength of the dairy herd with a decreased number of farm hands has compelled many dairymen to install milking-machines. Where the releaser principle is in evidence the satisfactory sampling and testing of milk from individual cows is more difficult, and causes more loss of time than with the hand-milking. We are hopeful that this difficulty will be overcome.

Despite the many circumstances which have militated against this testing work the majority of the associations have kept running, and their number has been augmented by the formation of new associations. The Aria, Piopio, and Waitanguru Dairy Companies united for the purpose of starting an association, and asked this Division to appoint a testing officer whose salary the association would pay. This arrangement has worked well, and good work has been done. There are now three associations in charge of Dairy Division officers paid by the dairy companies. Recent inquiries received would suggest that this method is likely to extend. Mr. S. S. Steele, who during recent years has been successfully running associations in the Cheltenham and Apiti districts, extended his operations to Awahuri and Woodville. This has been the means of considerably increasing the number of cows tested during the past season.

INSPECTION OF NEW ZEALAND DAIRY-PRODUCE ON BRITISH MARKET.

The advantage of having an officer in London who can report on the quality and condition of New Zealand butter and cheese as seen on arrival and also on the various markets has again been demonstrated by the valuable reports received from Mr. W. Wright. Where necessary, copies of these reports were sent to the dairy companies or factory-managers whose produce was commented upon by the London Inspector, and in this way an opportunity was afforded of inquiring into the cause of any particular faults in the produce examined. In addition to this work Mr. Wright has reported on many matters of special interest in regard to dairying, and thus kept this office informed of any new developments which came under his notice. It is to be regretted that Mr. Wright has been compelled to return to New Zealand on account of family reasons.

STAFF.

It is desired to place on record the willing assistance and co-operation of all members of the Division in carrying on the year's work. Unfortunately two of the Instructors have been absent on sick-leave for several months, and this has entailed extra work on other members of the staff; but the additional duties have been performed with a keen anxiety to make up as far as possible the shortage of help in this respect. Altogether there are now seven officers of this branch on active service or in military camp, all of whom at latest advice were reported as being well.

CHEMISTRY SECTION.

REPORT OF B. C. ASTON, F.I.C., CHEMIST.

Wellington, 26th June, 1917.

The Secretary of Agriculture, Industries, and Commerce.

I HEREBY transmit the annual report of this Section for the year ended 31st March, 1917.

B. C. ASTON, Chemist.

SOIL-SURVEY INVESTIGATIONS.

Primarily on account of certain deficiency diseases—*e.g.*, bush sickness—in live-stock pastured on some of the lighter soils a more extended examination of the types of soil on which these diseases occur has been authorized, and during the year 195 samples, representing 849 sub-samples, have been carefully collected under uniform conditions by the writer personally or under his direction. This work was performed mainly on holidays when the Laboratory was not open. In addition there remain from previous years 192 samples collected with similar care, most of which have been analysed but not reported on. The examination involves both chemical and mechanical analyses, and pot experiments conducted in a glasshouse which has been erected in the Laboratory precincts. It is hoped that some account of this work will be published during the coming year should no exigencies occur to occasion further delay.

Secondarily, when circumstances permitted, types of soils other than those on which these deficiency diseases develop have been collected with similar care with a view to future study and classification. Ultimately, when the types are known, the delimiting of the areas of each type may be commenced.

SOIL INVESTIGATIONS.

At the request of the Director of the Fields Division the cause of the so-called waterproof soils of the Ruakura Farm was investigated, and was determined to be probably due to wax. The matter was discussed, and our knowledge of the matter summarized, in an article by the writer on "Waterproof and Wax-bearing Soils," in the *Journal* for October, 1916. The results were most interesting, and showed that there was a field for research which gives hope of economic results.

For the past five years a number of soils have been analysed for various minor purposes, but the results had not been published. These were brought together and published in the *Journal* (July, 1916), under the heading, "Notes on Soils Analysed." Some further work has been done on the magnesia-sick soils of Nelson, and will be published later.

Several samples of diatomaceous or pure siliceous earths have been received, the origin of which in some cases is somewhat of a scientific puzzle. The quality is, however, often excellent, and samples have been submitted to one or two manufacturing firms who have intimated that they are prepared to adopt them in lieu of material which they have to import at present.

DEFICIENCY DISEASES OF LIVE-STOCK.

Further progress has been made in the research with a view to find the best composition for a stock-lick for use on the bush-sickness area. One may now say that the latest mixture is one that has given the best results and is most appreciated by stock, even calves taking it readily in the milk, and later, when on grass, going automatically to it when supplied in brick form. Some of this important research has had to stand over owing to more pressing calls on attention, but is being kept steadily in view.

TOXICOLOGICAL.

Numbers of valuable animals continue to be lost through being allowed access to poisons such as arsenical dipping fluids, lead paints, phosphorized pollard, &c. These cases, which are quite preventable and are due entirely to carelessness on some one's part, are in a different category from those caused by poisonous plants, when those in charge of stock are not so culpable. The instances which have been successfully investigated and the cause of death ascertained by chemical analysis are: From arsenical poisoning, forty young cattle at Mangamaire, four draught horses at Wairoa, and three cows at Ashley-Clinton; and from lead poisoning, five head of cattle at Feilding.

Attention has been drawn to the Wangaehu River, which rises in thermal waters in the Ruapehu crater, as a possible source of poisoning. One sample of water taken at Mangamaire yielded negative results, which, however, owing to the varying composition of the river-water, cannot be held to be conclusive. The melting of snow on Ruapehu, and the rainfall, probably cause this river to vary in composition of the dissolved bodies.

A case of suspected poisonous wine was investigated for the Horticulture Division with a negative result, which was borne out by the wine afterwards being successfully consumed.

POTASH.

Attention has become focussed on potash during the year, and various schemes have been publicly propounded with a view to the utilization of New Zealand resources in supplying any deficiency of potash salts owing to the war. A number of possible sources of potash for manuring

have been investigated, including the following: Timber-mill ashes. New Zealand bracken-fern, flax (*Phormium*) refuse, ashes of various shrubs, peat ashes, kelp and seaweed ashes, waste-paper ash. Of these the first three would seem to be the most hopeful sources. New Zealand seaweed samples sent in proved to be somewhat disappointing in potash-content, but possibly these were not representative samples. Further details may be found in an article by the writer published in the Department's *Journal* for June, 1917 ("Potash in Agriculture, Part 3"). The effect of potash fertilizers on typical New Zealand soils requires to be more carefully studied, using potash-demanding crops and such substitutes for the Stassfurt potash salts as are to be locally procured. In view of the success which the United States of America Department of Agriculture claims for roasted alunite (a double sulphate of potassium and aluminium, which before roasting contains 11·34 per cent. of potash) it may be worth while endeavouring to locate and ascertain the extent of the deposits of this mineral, which is said to occur in New Zealand. Considering that healthy tone and resistance to disease is one of the effects conferred on all plants by appropriate potash manuring, one of the first signs of a deficiency of potash in the food-supply to plants may be the failure of the crop through disease or even insect pests.

LIME AND LIMESTONE.

A large number (197) of limes and limestones have been analysed during the year, either for the Fields Division to assist in locating the best sites for kilns or quarries, or to ascertain the quality of the lime or ground limestone on the market for sale to farmers, or for the public who send in specimens for analysis. I have before pointed out that there are many localities where farmers might obtain crude limestone rubble or coarse dust for the mere cartage and labour expended in transporting it from the quarry to the land, leaving to natural agencies the task of further disintegration and solution of the coarse particles. Such soft limestone has been located in Nuhaka, Waipawa, and Hastings, Hawke's Bay (90 per cent.); Gladstone, Wairarapa (94 per cent.); Waiau, Amuri (73 per cent.); Ward, Marlborough (70 per cent.); Murchison (76·7 per cent.); Taihape (56 per cent.—very soft); Greymouth (91·8 per cent.); Cave, South Canterbury (80·1 per cent.); Pembroke, Lake Wanaka (94·6 per cent.—very fine); Gisborne (80·6 per cent.); Cook Islands (95·1 per cent.). A series of samples from the Chatham Islands showed that there is a good supply of high-grade hard limestone available there.

The few samples collected on the market proved to contain varying quantities of carbonate of lime and to vary greatly in fineness, but the question of legislation regarding the composition of limes and limestones sold is a somewhat difficult one on which there will be great differences of opinion. It is significant that in most other countries the sale of lime is not regulated by Act of Parliament. It is very questionable whether such a low-priced product as limestone or lime is (or should be) worth legislating about, and legislative restrictions may have the effect of raising the price to the consumer.

A development in carbonate-of-lime production which is worth recording is the attempt to utilize the huge deposits of Recent shells abounding on the littoral areas of the far north (Awanui) and on the Hauraki Plains. Some of these samples show a purity of 93 per cent., and 91 per cent. of the ground shells passed through a $\frac{1}{16}$ in. mesh sieve. This product is, it is stated, now sold at £1 2s. 6d. per ton, but it is hoped to reduce the price considerably.

Nineteen calcareous rocks from the Middle Clarence River district, containing proportions of magnesian carbonate varying from less than 1 to 15 per cent., associated with calcic carbonate and silica, have been analysed for the Director of the Dominion Museum.

PHOSPHATES.

The decrease in the net amount of phosphatic fertilizers imported during the year by about 38,000 tons is a warning that should not be neglected, in view of the possibility of a much greater shortage in the coming season. The Egyptian deposits, the value of which to New Zealand was pointed out by the writer some years ago, have furnished quite a substantial proportion (8,000 tons) of the total imported phosphates, and are capable of much larger development. Mixed with superphosphate this Egyptian phosphate makes a more useful compound on some soils in the same way that basic slag may be improved by mixing with superphosphate. Further details may be found in an article on the importation of fertilizers in the *Journal* for May, 1917.

Attention should be called to the waste of phosphates in New Zealand. Modern sewage disposal is responsible for a great waste of phosphate, but a waste seemingly inseparable from our western ideas of civilization. A waste which might well be stopped at once is that attendant on the disposal of fish-refuse. This is a valuable artificial fertilizer. After the 23 per cent. of oil had been expressed a sample contained 16 per cent. phosphoric anhydride and 9·8 per cent. nitrogen, worth according to present prices about £8 10s. per ton. The bones which accumulate round every farm and station-house are a valuable manure when broken up. This is somewhat difficult if no bone-reducing machinery be available, but they may be reduced to a fine state either by fermenting in a compost heap or by burning, when they may be easily reduced to a powder.

Two explorers subsidized by a Government research grant are busy in Canterbury endeavouring to find a phosphatic limestone. A sample received from Hawke's Bay contained 73 per cent. carbonate and 0·65 per cent. phosphate of calcium. The process of making Palmer phosphate is suitable for treating low-grade siliceous phosphates uncontaminated with carbonates, and is suitable for some New Zealand phosphates, especially when cheap hydrochloric acid could be made by electrolytic processes.

Much discussion has arisen concerning the merits of the various methods of conducting the citric-acid test for available phosphate in basic fertilizers, but a recent research in Britain tends to throw discredit on the citric method altogether.

Specimens of phosphate rock as examples of what to look for have been supplied to the public as before.

FERTILIZERS ACT.

Only nineteen samples were sent in for analysis during the year, compared with twenty-two the previous year. The results being satisfactory there was no cause for action. The Fertilizers Act is under discussion with a view to its amendment in the direction of giving credit for insoluble phosphates (rock phosphate) according to the fineness of the grinding it has undergone.

BUTTER FOR EXPORT.

Twenty-nine samples of butter have been analysed for the Dairy Division. These were chiefly to check the amounts of water found in the butter for export by the Graders, to ensure that a butter containing more than 16 per cent. should not be exported. Where more is found the practice is now to rework the butter at the expense of the dairy company, instead of prosecuting—a distinct advance in procedure and one dispensing with the analyst's attendance at Court.

Several samples of parchment paper used for wrapping butter have been examined with a view to detect a cause for unsightly discolouration of the butter and the growth of moulds thereon. Two samples contained sugars equivalent to 10 per cent. and 6 per cent. of dextrose respectively. For further information on the subject, see the writer's "Wrapping-papers and Mouldy Butter" in the *Journal*, Vol. 5, p. 506.

MISCELLANEOUS WORK FOR THE DEPARTMENT.

Live-stock Division.—A number of patent or proprietary veterinary medicines and stock-licks have been analysed for the Director, one of which proved to be of very little value compared with the price asked. A few calf-foods were also analysed. The analysis of poultry-foods elicited some interesting information. A sample of lucerne-meal prepared by the Department for feeding to poultry contained 20 per cent. of proteids, and should prove a most valuable food. An inquiry regarding the use of acorns for feeding poultry drew the statement from the Chief Poultry Instructor that they had the effect of discolouring the yolk of eggs to a dirty greenish colour, thus diminishing the apparent market value of the eggs.

Fields Division.—A number of fertilizers used in the field experiments have been analysed. The gum of New Zealand flax (*Phormium*) has been examined with a view to determine if it could be used as an adhesive gum, with a negative result. Farmers have been advised as to the best artificial and other fertilizers to apply to their soils.

Horticulture Division.—Some waters have been examined to determine their value in making spraying-mixtures. Some proved unsuitable owing to excessive salinity.

Dairy Division.—A number of milks have been analysed for preservatives. Some samples of imported cheese were found to be preserved with boron compounds, and also gave the reaction for formaldehyde. A number of waters have been analysed to ascertain their suitability for dairy-factory purposes. With a view to ensure the supply of pepsin to dairy factories the Chemistry Section inquired as to the amount immediately available in the Dominion, and obtained as a result of these inquiries, from seven different sources, 121 lb. of pepsin preparations. As a result of co-operation with the Dairy Division the labour of testing milk and cream samples in this Laboratory has been somewhat diminished. With the consent of the Director it has been decided to discontinue the testing in this Laboratory of calibrated dairy glassware for the public.

The trouble with the corrosion of tinned iron or copper vats in dairy factories, mentioned in my last annual report, has been apparently paralleled by an instance investigated in the United States of America in roofing-material of tinned copper; and the cause has been referred to the variation in the mechanical abuse, such as scratching, to which it is subjected, and also in the uniformity of structure and thickness of the tin-coating (Technologic Paper No. 90, Bureau of Standards, Washington, U.S.A., abstr. in *J. Franklin Inst.*, 1917, Vol. 183, p. 350). This, therefore, bears out the advice given in the last report.

Publications.—Six articles have been specially written during the year for publication in the *Journal*, including one not previously mentioned, viz., "Rats and their Destruction" (March, 1917).

WORK FOR OTHER DEPARTMENTS.

Defence Department.—The examination of potable waters for the troopships has been continued, 259 samples having been tested during the past year. Connected with this Department was the experimental use of light oil as an anti-vermin dressing for soldiers' shirts for the Mayoress's patriotic workers. The first experiment was made in this Laboratory, using the fraction boiling about 200° C. distilled from tar-oil. This is proving much less costly than the preparation previously used. Whether it will prove as efficacious remains to be seen.

FOREST PRODUCTS UTILIZATION.

The question of the utilization of those forest products other than timber, such as sawdust, firewood, wood-ashes, tannins, dyes, products of destructive distillation (acetone, acetic acid, methyl-alcohol (wood-spirit), charcoal, wood-tar and its products), potash, wood-pulp, varnishes, and resins, is constantly cropping up in these days of struggle for greater national efficiency and prevention of waste. No doubt the utilization of such by-products in timber-getting would best be accomplished by the management engaged in the main industry rather than by separate organization. A more cleanly clearing of the land by the sawmiller would liberate for immediate grassing large areas which under the present system are cumbered with stumps for a number of years. It is hoped to do some systematic laboratory work on forest products during the coming spring.

STAFF.

Owing to the war considerable changes have taken place in the personnel of the junior members of the staff during the year, changes which could only be expected to be productive of inconvenience and delay. I have to express my thanks to the staff generally, and in particular to Mr. F. T. Leighton, sen., Laboratory Assistant, for the way in which the work has been carried out.

BIOLOGY SECTION.

REPORT OF A. H. COCKAYNE, BIOLOGIST.

Central Development Farm, Weraroa, 3rd July, 1917.

The Secretary of Agriculture, Industries, and Commerce.

I FORWARD herewith a brief report concerning this Section for the year ended 31st March, 1917.

A. H. COCKAYNE, Biologist.

REMOVAL OF SECTION TO WERAROA.

So far as the Biology Section of the Department is concerned the decision to transfer it to the Weraroa Experimental Farm, now known as the Central Development Farm, is the most important that has been made since its inception. The work of the Section, although purely scientific in its general aspects, is so closely connected with many phases of the practice of farming that its work was much handicapped by being carried out in a city rather than in a rural environment. It is to be hoped that by the carrying-out of the transfer much of the work of the Section will be of immediate value and its significance to agricultural practice recognized, owing to the close co-operation of actual farm operations and scientific investigation. Plenty of scope for testing the practical application of laboratory study will be available, and this alone fully justified the removal of the section to a centre of practical agricultural activity such as the Central Development Farm. (The Section was transferred to Weraroa on the 1st May, 1917.)

In addition to the carrying-out of the ordinary routine and scientific duties of the Section, its location at the Central Development Farm renders possible its close co-operation with the Fields Division in rendering instruction in agricultural botany and agricultural entomology to the student-assistants in residence on the farm. Again, for many years past the Section has identified itself very closely with many of the problems of pasture-production and pasture-management, and its advice on those matters is now freely taken by the Fields Division. The removal of the Section to the Central Development Farm and the opportunities thus provided for thoroughly studying pasture problems must greatly enhance the value of such advice, based as it will be on the actual scientific observation of pastures themselves. So far as I am personally concerned, I cannot refrain from expressing my gratitude to the great Service to which I belong in removing my Section to a location that should render easy its work becoming of great value to the farming interest of the Dominion.

GENERAL ROUTINE WORK.

A very large number of specimens, both botanical and zoological, have been dealt with during the year. Especially numerous were the inquiries regarding pasture plants, and the great interest shown in this subject clearly shows that the importance of pastures in the maintenance of our productive capacity is fully realized.

SEED-TESTING.

During the year 3,259 samples of agricultural seeds were tested for seed-merchants, and in addition some 600-odd received from private individuals and the Fields Division were dealt with. The system of charging fees for testing commercial lines of seed has been extremely popular.

It appears as if the time were ripe for the introduction of some system of seed-control legislation, especially with regard to imported seed, but it is perhaps unwise to adopt any system until after the war. It is interesting to note that although Germany had a very strong hold on the New Zealand seed trade in 1914 her trade has been found to be quite unessential, and it is to be hoped that in the future there will be no necessity to rely on her for the production of any seeds.

NEW ZEALAND FLAX DISEASES.

Mr. David Miller has continued his investigations regarding flax-pests during the year, with the exception of two months when his services were loaned to the Department of Internal Affairs to study mosquito conditions in North Auckland. Mr. Miller has secured much valuable information on the life-history and habits of the flax-caterpillar, but owing to the very heavy floods experienced in the Manawatu district it has not caused any appreciable damage this season.

ROOT-KNOT.

In co-operation with Mr. C. C. Brittlebank, Plant Pathologist to the Victorian Government, and Professor Champtaloup, an investigation of the causative agent of root-knot was carried out. An organism morphologically identical with *Bacterium tumefaciens* was isolated, but gave negative reinoculation results.

TURNIP-DISEASES.

Dry-rot, soft-rot, and club-root of turnips have been investigated at some length during the year, but the matter requires a very large amount of patient investigation before any definite methods for control can be formulated. This matter is one of very great importance, especially with regard to dry-rot in Southland, where the disease is making the growing of swedes extremely precarious. It is proposed to make a special initial investigation during this winter.

" JOURNAL " ARTICLES.

During the year a number of articles on matters dealt with by this Section have been published in the *Journal of Agriculture*. These aggregated about a hundred pages, and were illustrated with photographs taken by members of the Section.

STAFF.

During the year Mr. E. H. Atkinson enlisted in the Imperial Motor-boat Patrol, in which branch of the service he now holds a commission. In December Miss H. Jensen resigned her position as Seed Analyst, and her place was taken by Mr. Nelson Foy, who was transferred to this Section from the Head Office. During the greater part of the year Mr. E. B. Levy, Laboratory Assistant, was located at Weraroa for the purpose of superintending various experimental work, more particularly those connected with pastures. Mr. R. Waters, my senior Laboratory Assistant, has been transferred to Dunedin for six months to undergo a course of bacteriological training under Professor Champtaloup, of Otago University, in order to undertake bacteriological work in agriculture connected with this Section.

